EVALUATION OF THE 2012/13 FARM INPUT SUBSIDY PROGRAMME, MALAWI

FINAL REPORT

November 2013

Andrew Dorward*, Ephraim Chirwa**, Mirriam Matita***, Wezi Mhango***, Peter Mvula**,

Ed Taylor****, Karen Thorne****

Further inputs provided by Anthony Whitbread, Anne Sennhenn& Kristina Grotelüschen *****

* SOAS, University of London, ** Wadonda Consult and Chancellor College, University of Malawi, *** Wadonda Consult and Lilongwe University ofAgriculture and Natural Resources,**** University of California (Davis), ***** University of Goettingen

Undertaken for the Ministry of Agriculture and Food Security

Funded by:

DFID

Acknowledgements and Disclaimer

Different team members contributed to different sections of the report. The team would like to express their thanks to members of staff of the Ministry of Agriculture and Food Security, members of the fertiliser and seed industry, staff of donor organisations, farmers and others who have generously given time and information for the compilation of this report. Any errors or omissions remain the responsibility of the authors.

The views expressed in this report imply no endorsement by the Ministry of Agriculture and Food Security, DFID, or any other party.

This material has been funded by UKaid from the Department for International Development; however the views expressed do not necessarily reflect the organisations' official policies.

EVALUATION OF THE 2012/13 FARM INPUT SUBSIDY PROGRAMME, MALAWI

FINAL REPORT

November 2013

Executive Summary

This report evaluates the 2012/13 Malawi Government Farm Input Subsidy Programme (FISP). The main objective of the evaluation is to assess the impact and implementation of the FISP in order to provide information regarding

- the overall value for money of investments in the FISP as regards its contributions to agricultural production, food security, farmers' and consumers' welfare
- means by which future implementation of the FISP might be changed in order to improve its effectiveness and efficiency

The evaluation combined qualitative and quantitative methods of data collection and analysis. Quantitative data were collected through a national survey in April and May 2013 of 2,000 households, a survey of retail shops selling inputs in six districts, and from a variety of secondary sources including Logistics Unit reports on programme implementation and Ministry of Agriculture and Food Security data on market prices. The quantitative data were triangulated by qualitative data from focus group discussions with smallholder farmers in 14 districts, and key informant interviews with government staff, input distributors and beneficiary and non-beneficiary households. The analysis is based on descriptive statistics and econometric, crop yield simulation and local economy wide modelling.

We consider in turn the two main questions that the report addresses, beginning with the overall contributions and value for money from the FISP.

The FISP medium term plans sets out the objectives of the FISP as being to 'increase food security at household level through agricultural output growth' by increasing agricultural productivity and input market development. However economic theory and experience from other countries suggests that if implemented consistently, effectively and efficiently at a manageable cost the programme has the potential to drive broad based national economic growth and diversification by raising the productivity of the agricultural land and labour held by the large rural population, lowering food prices, raising real wages, and stimulating non-agricultural demand and supply. This depends upon the ability of the programme to cost effectively increase seed and fertiliser input use in maize production, drive up maize productivity and improve input supply services (the direct impacts of the programme) with the support of complementary policies that support low maize prices, rising real wages and rural diversification (the indirect impacts of the programme).

Increases in production and maize productivity as a result of the programme are difficult to assess. Bringing together evidence from a wide range of sources, section 7 of the report suggests that the programme led to increased production of around 723,000MT of maize and 32,000MT of legumes. Malawi's rapidly growing population means that the programme's incremental production benefits are increasingly important for Malawi's national food security. These benefits are however undermined by likely informal exports (despite an export ban) encouraged by pressures from the relatively low dollar denominated maize prices in Malawi following the major devaluation of the Kwacha. The programme also led to increased profitability of maize production by beneficiary households and increased rural incomes by between MK50,000 and MK70,000per household receiving and using a full pack of fertiliser and maize seed (ignoring spillover effects and benefits from receipt of fertiliser that does not contribute to incremental production).For many poorer beneficiaries, who receive only one coupon for 50 kg of fertiliser, it seems that benefits are only sufficient to reduce their food insecurity, and are not enough to enable them to advance their livelihoods – to 'step out' or 'step up' rather than just 'hang in'. Addressing this in the context of

both limited fiscal resources and rapidly growing population pressure is a major challenge facing the programme and the Government and country as a whole. There is, however, evidence that the FISP is encouraging some diversification out of maize into increased legume production.

Assessment of the potential wider indirect impacts of the programme (addressed in section 8) requires comparison of situations with and without the subsidy. A Local Economy Wide Impact Evaluation (LEWIE) model, a novel form of CGE modelling, investigating this suggests that there are significant spillover local growth effects from the subsidy as a result of both its injection of cash into the economy and of the increase in real incomes caused by its raising land and labour productivity. However real wage rates fell during 2012/13 as a result of rising maize prices, which, as mentioned above, have been affected by the devaluation of the Malawi Kwacha and consequent export and inflationary pressures. It is not possible to estimate possible effects of FISP in reducing the extent of the fall in wages. These wider influences on maize prices pose a major challenge to the welfare of poor Malawians and to the Malawian economy, with or without the FISP. Policies that address this and promote low and stable domestic maize prices are essential for FISP to deliver improved food security and the wider growth benefits outlined above – and some specific options are suggested.

The overall benefit cost ratio (BCR) for the FISP is estimated at 1.7taking account of only direct impacts, and at1.8if wider indirect impacts are also included. Fiscal efficiency (the ratio of net economic benefits to government expenditure) is estimated at 0.75for direct impacts and 1.04 including indirect impacts. Analysis of national food security scenarios with and without the FISP suggests that in the last 6 years it may have led to average annual savings of maize imports of some 385,000MT, directly offsetting up to between 85 and 110% of programme costs. Benefit cost ratio estimates are however sensitive to some of the parameters used in their calculation, notably maize prices, incremental maize productivity, and fertiliser costs. The Fiscal Efficiency of the programme and its overall cost are also affected by likely high rates of input leakage and of displacement of unsubsidised farmer purchases by subsidised inputs, and by the subsidy rate and low farmer contributions. The importance of low and stable maize prices for programme benefits has been discussed above. More attention to these issues in the implementation of the programme could lead to substantial increases in the effectiveness and efficiency of the programme with increased benefits and/or reduced costs.

Analysis of determinants of maize productivity shows that yields are generally increased by early planting, early and good weeding, use of hybrid seed, use of inorganic nitrogenous fertiliser and of phosphate where soils are phosphate deficient, and use of organic fertilisers. Returns to use of inorganic fertiliser are also increased by use of hybrid seed, use of organic fertiliser, and higher plant density. Gains from using subsidised inorganic fertiliser and hybrid seed may also be substantially reduced if use of subsidised inputs leads to delays in planting. These observations, which are widely known, underpin many aspects of the design and implementation of the FISP, for example the increasing provision of hybrid and legume seeds in the subsidy package, the intention to provide coupons and inputs early in the season (with priority given to the south, then centre then north), and the inclusion of both nitrogenous and compound fertilisers. Analysis of the implementation of the programme in section 4 and of the timing of receipt of coupons by households in section 6 shows that a number of reasons (some of them beyond the immediate control of programme management) have led to late access to coupons and inputs – and this tends to raise costs and increase displacement as well as reduce yields. Incremental production is also affected by displacement rates and by leakages of inputs through theft and corruption.

Programme costs have been held in check from 2009/10 with much better physical control of quantities of subsidised fertilisers. As noted in section 4, there are opportunities for reducing fertiliser procurement costs (and improving timeliness of delivery) through modified tender and payment procedures. Programme costs could also be reduced by increasing farmer contributions as a proportion of input costs, and there is a difficult balance here between on the one hand supporting those who can least afford inputs and benefit most from a high rate of subsidy, and on the other

hand reducing overall programme costs. A third way of reducing programme costs and/or increasing benefits is to reduce displacement and leakage, with improved security of coupons (where there has been substantial improvements in 2011/12 and 2012/13); better transport tendering and monitoring procedures (the latter building on approaches trialled with ESOKO in 2012/13); more timely input delivery, market opening and coupon distribution; and better targeting of inputs to poorer farmers unable to afford unsubsidised inputs. Increased farmer contributions may also decrease the incentives for theft, corruption and leakage. Determination of more precise numbers of farm families and (building on useful innovations in 2012/13) greater farmer access to and understanding of publicly available beneficiary lists could also improve targeting outcomes and accountability and control of coupons. Greater use of use of such systems will, however, have to take account of the support for and benefits from the widespread 'sharing' of coupons in the Central and Southern Regions.

Increasing attention to matters of accountability, access to coupons, and conditions at markets are to be welcomed and will no doubt be built on as more information becomes available on their strengths and weaknesses.

Despite its high cost, the FISP is making a positive set of contributions to the welfare of Malawians, and this represents a considerable achievement by all those involved in its resourcing, design and implementation in challenging conditions. These contributions are however threatened by macroeconomic pressures; by high and increasing population pressure in rural areas; by the high visibility of instances of late implementation, corruption and theft; by evidence of poor targeting; and by political and economic pressures. These contributions and these pressures call for renewed efforts to both work for and demonstrate improved efficiency and effectiveness and increased benefits and probity of the programme.

In order to facilitate wider and better informed debate around the FISP, this report will be supplemented by two short policy briefing papers summarising key issues raised regarding FISP implementation and impacts. The value of this report is, however, that it brings together in one place a comprehensive review of the programme. Readers are advised to refer to those sections that are of direct interest and not be put off by the size of the report as a whole. The 'summary and conclusions' section at the end of the report contains a longer and more detailed summary of the report.

EVALUATION OF THE 2012/13 FARM INPUT SUBSIDY PROGRAMME, MALAWI

FINAL REPORT

November 2013

Contents

Tables

Figures

EVALUATION OF THE 2012/13 FARM INPUT SUBSIDY PROGRAMME, MALAWI

FINAL REPORT

November 2013

Andrew Dorward, Ephraim Chirwa, Mirriam Matita, Wezi Mhango, Peter Mvula, Ed Taylor, Karen Thorne

Further inputs provided by Anthony Whitbread, Anne Sennhenn & Kristina Grotelüschen

1 Introduction

This report presents the main conclusions of an evaluation of the 2012/13Farm Input Subsidy Programme (FISP). The main objective of the evaluation is to assess the impact and implementation of the FISP in order to provide information regarding

- the overall value for money of investments in the FISP as regards its contributions to agricultural production, food security, and farmers' and consumers' welfare
- means by which future implementation of the FISP might be changed in order to improve its effectiveness and efficiency

The evaluation addresses the major processes and factors that affect the impact of the input subsidy programme as set out in figure 1.1. At the heart of figure 1 is the implementation of the input subsidy programme (1). The scale of this and the way that it is done impact directly on voucher recipients (2a), on the input supply system (3) which is composed of private sector suppliers, ADMARC and SFFRFM, and on the macro-economy and its management (4). The livelihoods, activities and welfare of voucher recipients then affect relationships within rural communities and local and wider markets for maize and ganyu(2b), and this impacts upon non-recipients (2c). All of these components interact with each other and with wider factors in the environment, shown on the right hand side of the diagram. Another set of interactions arise between impacts of the input subsidy on the one hand and impacts of other (formal and informal) social protection measures.

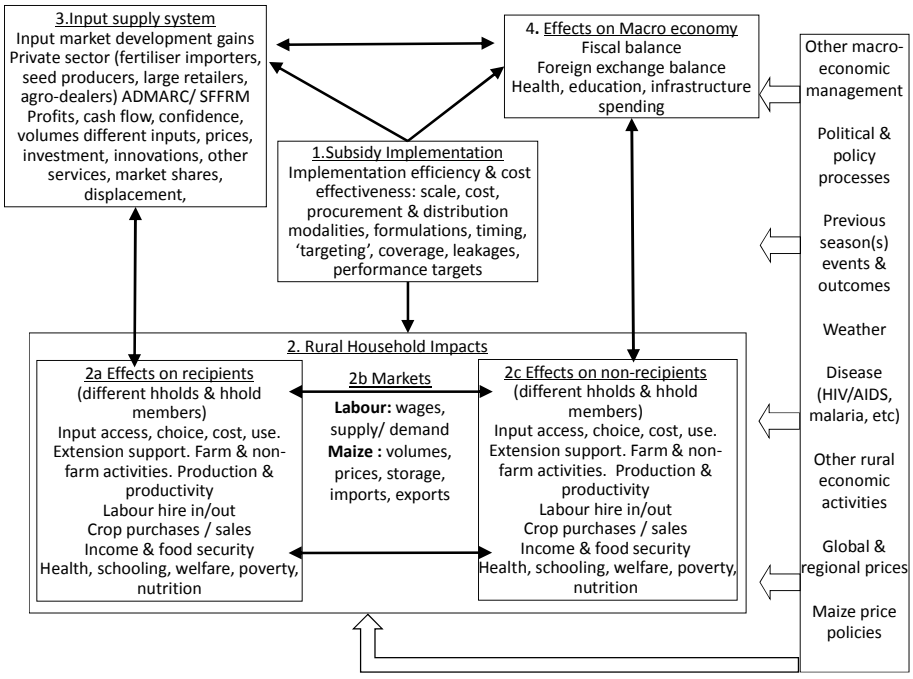

Figure 1.1 Analytical Framework for FISP Evaluation

The evaluation has been implemented and managed in five modules related to the analytical framework set out in figure 1.1, and supported by cross cutting activities. Table 1.1 shows in broad terms how the modules contribute to evaluation of elements along the FISP impact pathway.

Table 1.1 Main module contributions to evaluation of FISP impact pathway

		Impact Pathway		
Modules		Implementation	Outputs	Impacts
Implementation		X		
Household survey		X	X	X
Input supply system		X		X
Maize & labour markets				X
Modelling & economic analysis			X	X

The report is structured in 11 sections. Following this introduction is a brief presentation in section 2 of background to the 2012/13 FISP. Section 3 provides a description of data sources and analytical methodologies used. Section 4 then summarises the implementation processes and achievements of the 2012/13 FISP. Sections 5 to 10 then provide the major information regarding the outputs and impacts of the 2012/13 FISP, broadly following the modular approach to the study, though recognising strong interactions between modules. Section 5 considers impacts on input suppliers, section 6 reports on beneficiaries' access to and use of coupons and subsidised inputs, including issues around coupon distribution and factors affecting household access to coupons and subsidised inputs. Sections 7 and 8 then discuss direct impacts on production and wider impacts on rural livelihoods and the rural economy, before section 9 briefly considers impacts on the macro economy. Section 10 reports on benefit cost analysis and national food security contributions before section 11 concludes with a synthesis of the main findings.

Evaluation of the FISP is a complex and challenging task:

- The programme is highly politicised due to its importance to the people of Malawi and its very large cost;
- There are multiple stakeholders with a wide range of differing and often strong interests in different aspects of the programme;
- There are multiple potential direct and indirect impacts of the AISP which interact with and are dependent upon other major policies, and these interactions occur at multiple levels and involve a variety of different logistical, market, livelihood, fiscal, social and political processes which are often highly variable, changing, imperfectly understood, and the subject of much debate;
- There are likely to be dynamic impacts of the program that influence maize production and price levels in future years (e.g., the impacts of the input subsidy program have undoubtedly affected current maize prices, which influence real incomes, future price expectations and land and labour allocation decisions, and these in turn have wide ranging effects on economic activities and welfare).;
- There is considerable variability between and within areas regarding programme implementation and impact.

There are consequently significant data and methodological difficulties in undertaking the analyses required to provide clear answers about the impact of the programme.

In this context it is important that any evaluation of FISP takes full account of the context of FISP in Malawi, of its history and performance since its inception in 2005/6, and of the findings of the wide range of studies and reports on this.

In order to facilitate wider and better informed debate around the FISP, this report will be supplemented by two short policy briefing papers summarising key issues raised regarding programme implementation and impact. A key feature of this report, however, is its bringing together in one place a comprehensive review of the programme. Readers are advised to refer to those sections that are of direct interest and not be put off by the size of the report as a whole. The final concluding section also summarises the main issues raised in each section.

2 Background

The FISP was implemented for the first time in 2005/6, although it was at that time known as the Agricultural Input Subsidy Programme or AISP. Full information on the background to its introduction and on the specific features of Malawian smallholder agriculture and rural livelihoods that affect the potential roles of FISP in promoting food security, agricultural productivity and wider pro-poor growth can be found in Chirwa and Dorward (2013a) chapter 4 and School of Oriental and African Studies et al. (2008). Information is provided on the evolution of the programme over time and changing design, implementation, costs, outputs and impacts throughout this report. Further information can be found in previous evaluation reports and a variety of papers listed at and downloadable through http://www.soas.ac.uk/cedep/research/malawi-subsidies/.

Background information on the theory and practice of agricultural input subsidies can be found in Chirwa and Dorward (2013a) chapters 2 and 3, with further publications available at or through http://www.soas.ac.uk/cedep/research/agricultural-input-subsidies/.

3 Data sources and methods

A variety of information sources have been used in preparing this report. These are best considered in terms of the five modules outlined earlier:

A. ***Input subsidy implementation module:*** This module relies heavily on monitoring information from the Logistics Unit, supplemented with information from a variety of stakeholders and information sources.

B. ***Household survey module:*** This module involved in-depth qualitative focus group discussions and key informant interviews together with single-visit household and community surveys, with a sample of 2,000 households in 100 enumeration areas (EAs) across 14 districts in the three regions and representing all livelihood zones except the very small Chitipa Msuku Hills zone (see tables 1.2 and 1.3 for details of the sample). To provide 2012/13 estimates, household observations were weighted by EA household population and zone household population estimated from 2008 census household records inflated by intercensal rural household growth rates. A further sample of 120 households were sampled in six enumerations areas in Lilongwe and Zomba districts with resident enumerators working closely with sampled households to record plot areas and yields for maize and legume crops. This provided in-depth, richer information not collected in the single visit survey. Quantitative surveys were supplemented by systematic focus group discussions in sampled enumeration areas to provide crucial insights into farmers' experience and perceptions of subsidy programme implementation and impacts on rural livelihoods.

Table 1.2 Household and Community Survey Samples by District

District	Number of EAs	Household Interviews	Community Interviews	Key Informant Interviews	Focus Group Discussions
Chitipa	5	100	5	3	2
Karonga	6	120	6	3	2
Mzimba	7	140	7	3	2
North	18	360	18	9	6
Kasungu	5	100	5	3	2
Nkhotakota	6	120	6	3	1
Lilongwe	15	300	15	3	1
Dedza	4	80	4	3	2
Ntcheu	6	120	6	3	2
Centre	36	720	36	15	8
Mangochi	12	240	12	3	2
Machinga	5	100	5	3	2
Phalombe	4	80	4	3	2
Blantyre	7	140	7	3	2
Thyolo	11	220	11	3	2
Chikhwawa	7	140	7	3	2
South	46	920	46	18	12
Total	100	2000	100	42	26

Table 1.3 Sample Household Characteristics by Zone and Region

Livelihood zone	Sample	Rural households	% Female headed	% Youth headed	HH size (persons)	Cultivated area (ha)
Border Productive Highlands	80	80,770	24%	15%	4.6	1.02
Chitipa Maize and Millet &Misuku	100	38,535	39%	5%	5.6	1.00
Central Karonga	40	9,593	21%	0%	5.2	1.06
Kasungu-Lilongwe Plain	400	770,132	21%	11%	4.7	1.10
Lower Shire	140	150,598	18%	7%	4.8	0.80
Middle Shire	100	108,954	21%	14%	4.9	0.98
Mzimba Self-Sufficient	100	102,084	32%	11%	4.2	0.72
Northern Karonga	40	25,226	31%	3%	4.8	1.27
Nkhata Bay Cassava	40	64,878	23%	7%	5.1	1.01
Northern Lakeshore	120	61,683	19%	1%	5.4	0.85
Lake Chilwa - Phalombe Plain	180	301,821	29%	10%	5.5	1.03
Pirilongwe Hills	80	48,926	39%	14%	4.8	0.80
Rift Valley Escarpment	120	270,484	31%	12%	4.5	0.96
Shire Highlands	221	314,409	36%	12%	4.2	0.78
Southern Lakeshore	80	91,425	36%	6%	5.2	0.78
Thyolo-Mulanje Tea Estates	120	164,775	24%	13%	4.1	0.78
Western Rumphi and Mzimba	40	49,944	16%	6%	5.0	1.32
Total	2001	2,654,237	26%	10%	4.7	0.96
Region						
North	360	322,516	27%	7%	5.0	1.14
Centre	720	1,115,355	23%	11%	4.7	1.05
South	921	1,216,366	29%	11%	4.5	0.82

C. ***Input supply system module:*** This module involved a census and survey of retailers in a sub-sample of the EAs sampled in the household survey and district service centres supplying them, together with key informant interviews. It also drew on information from the household survey. Table 1.3 provides details of the sampled districts and suppliers. The module encompassed both private sector and parastatal suppliers, with a particular interest in the subsidy programme interactions with and impact on independent agro-dealers.

Table 1.4 Summary of Interviews Completed by Type of Trader

District	Type of Input Trader						Total
	Distributor for Major Importer	ADMARC	SFFRFM	Cooperative or Association	Independent Agro-Dealer	Other**	
Karonga	4	14	0	0	32	0	50
Mzimba	6	9	1	6	28	0	50
North	10	23	1	6	60	0	100
Kasungu	9	8	1	0	30	2	50
Lilongwe	10	10	3	0	27	0	50
Dedza	10	0	1	0	22	0	33
Centre	29	18	5	0	79	2	133
Mangochi	4	10	1	3	32	0	50
Zomba	5	14	3	0	28	0	50
Chiradzulu*	0	0	0	0	2	0	2
Blantyre	3	5	0	1	37	4	50
Thyolo	3	9	1	0	32	0	45
Mulanje*	0	0	0	0	3	0	3
Phalombe	1	6	0	0	6	0	13
South	16	44	5	4	140	4	213
Total	55	85	11	10	279	6	446

* These districts are not sampled districts but the input sellers were on the border of districts and also serve farmers from the sample districts;

** includes wholesales and supermarkets

D. ***Maize and labour markets module:*** Maize markets were investigated using MoAFS retail price information, FEWSNet information on cross border trade volumes and information on farm gate and retail prices collected from the household surveys. Labour markets were investigated using information from IHS3 and module B household and community survey data and focus group discussions supplemented with data gathered in the resident enumerator survey.

E. ***Modelling & economic analysis module:*** Wider FISP impacts cannot be estimated from comparisons of subsidy recipient and non-recipient households. Allowance for the indirect or wider economy impacts of FISP and their mediation of direct impacts therefore requires formal modelling of impact pathways within the economy and/or estimation of indirect impacts from direct impacts using plausible and empirically determined estimates of the relationship between direct and indirect impacts. General equilibrium effects were investigated by building up Local Economy Wide Impact Evaluation (LEWIE) models (developed by Taylor, (Taylor, 2012).

4 Programme implementation & costs

Implementation of the subsidy programme involves a large number of complex and very significant logistical and organisational tasks with critical seasonal deadlines. In 2012/13 this involved selection of over 1.5 million beneficiaries from 4.4 million registered farm households, printing and distribution of over 6 million coupons, and purchase and distribution of over 3 million bags of fertiliser and of nearly 3 million bags of seed –to tight deadlines, to a large proportion of Malawi's farmers (many of whom are illiterate or semi-literate) widely dispersed across the whole country, some in remote and poorly accessible areas, with the constant temptation and threat of fraud or theft of highly valuable commodities worth around MK51 billion (US$140 million) in total.

We present information on the major tasks and stages of programme implementation in terms of input (fertiliser and maize and legume seed) procurement, beneficiary identification and coupon distribution, and coupon redemption. We do not reproduce the detailed information and recommendations provided in the Logistics Unit Report beyond summarising and drawing attention to critical issues, and relating them to information from other sources. The focus is on issues relevant to *cost effective implementation*, that is implementation achievements that contribute to beneficial impacts from the programme (in terms of beneficiary input access that promotes achievement of FISP's production and food security objectives at minimum cost). This section reports on implementation in terms of delivery and distribution processes and outcomes relying primarily on information from the Logistics Unit and weekly task force reports. Subsequently sections 5 and 6 provide information on input supplier and farmer perspectives on coupon and input distribution and access.

4.1 Fertiliser procurement and distribution

As has been the case since the 2008/9 season, fertiliser procurement was entirely the responsibility of government, with no retail sales of subsidised fertiliser procured by private companies. Planning and tendering for fertiliser importation and procurement for fertilisers was initiated earlier than in previous years, with bidding documents issued in mid-March 2010 for public opening in early May. However in July it was announced that there would be a fresh call. Bids were opened in mid-August and tender awards were announced in mid-September. A total of 150,000MT was to be procured, with 55,000MTS of NPK (23:21:0:4S and 23:10:5:+6S+1.0Zn) and 65,000MTS of Urea procured under the tender and a further 15,000MTS NPK and 5,000MTS Urea to be supplied by SFFRFM and 5,000MTS NPK and 5,000MTS Urea to be supplied by ADMARC. Prices by supplier are shown in figure 4.1. This shows quite large variations in prices. For NPK there was a price spread a little under $100/MT fairly evenly distributed across all suppliers, while for urea there was much a greater and more uneven price spread of about $150/MT. The spread on NPK is much narrower than in 2010/11 (when it was around $200/MT) but is larger for urea (the 2010/11 spread was $100, excluding one exceptional award). In 2010/11, however, urea prices were lower than NPK prices, as is normally the case with world prices. Apparent discrepancies may be explained in part by the need for the late tender awards to take account of stock availability in country, with high price tenders with immediately available stock being preferred over lower price awards requiring importation, and over lower price tenders where bidders did not meet other award criteria. However the four highest priced awards for urea were all delivered in late November or in December.

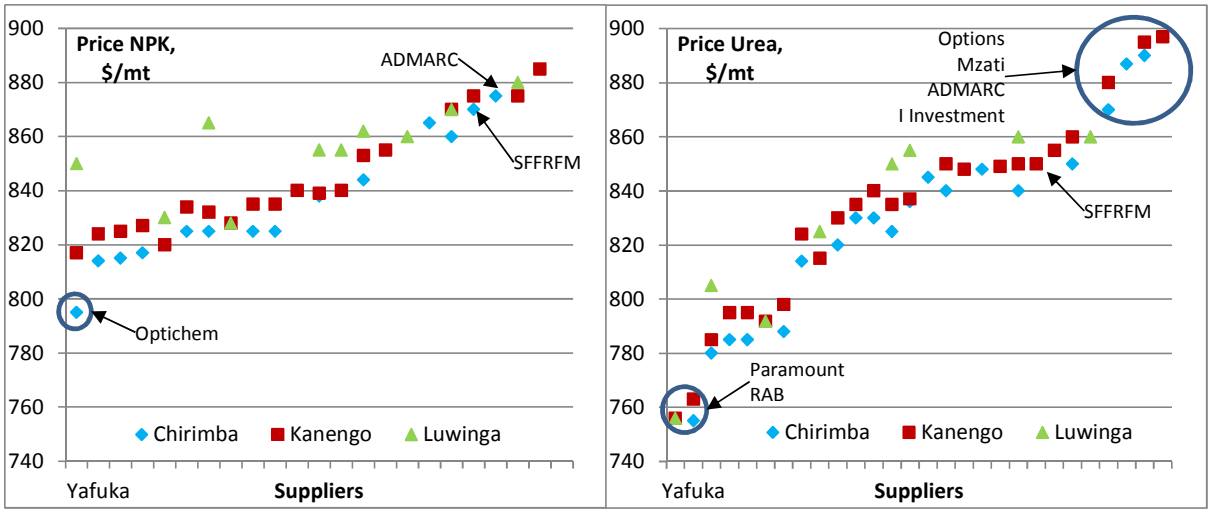

Figure 4.1 2012/13 Mean Fertiliser prices by supplier

Source: Calculations from Logistics Unit, 2013

Figure 4.2 therefore compares unit fertiliser costs incurred by the programme with international prices and market prices starting from the 2009/10 season (as 2008/9 world prices were exceptionally high).

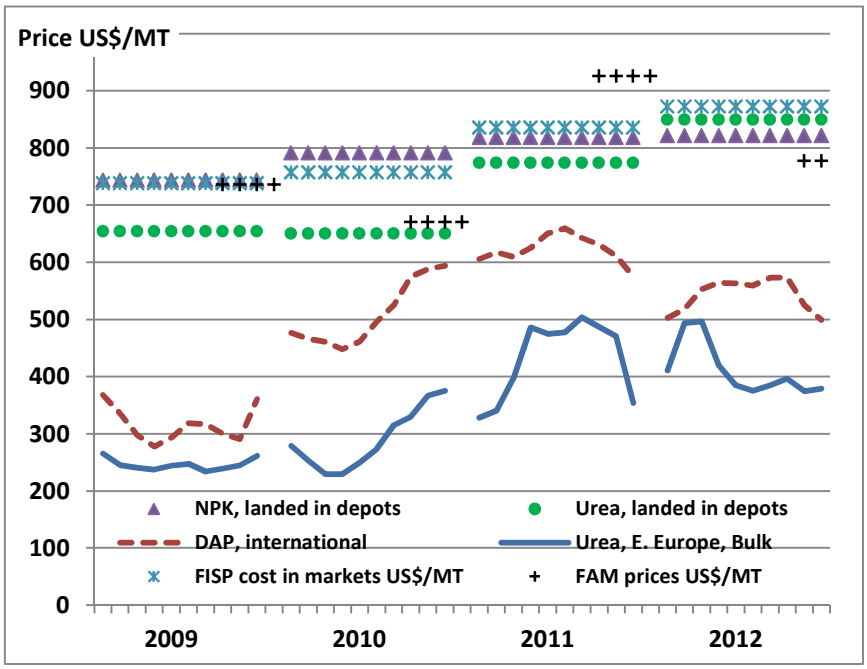

Figure 4.2 Unit fertiliser costs comparisons, 2009/10 to 2012/13

Sources: Calculations from Logistics Unit annual reports; World Bank Commodity Prices; FAM.

The breakdown of awards by region and fertiliser type is given in table 4.1. This table shows that 82% of procurement was supplied by private importers and 18% by SFFRFM and ADMARC. There were no stocks brought forward from the previous season. Figure 4.3 shows a comparison of procurement sources over the life of FISP.

Table 4.1 Fertiliser procurement and availability by region and type (MT)

Fertiliser	NPK	UREA	Total	Share
South	35,425	35,425	70,850	46%
Centre	31,820	31,820	63,640	41%
North	9,975	9,975	19,950	13%
National	77,220	77,220	154,440	100%
ADMARC	5,000	5,000	10,000	6%
SFFRFM	13,010	5,000	18,010	12%
Private sector	59,210	67,220	126,430	82%

Source: Logistics Unit (2013)

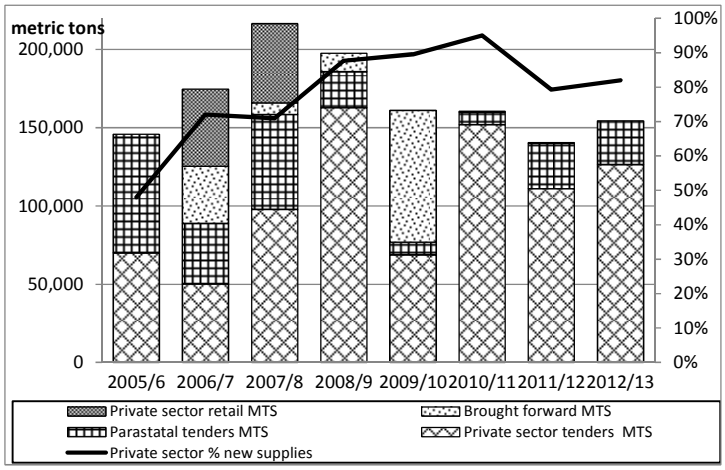

Figure 4.3 Fertiliser sources, 2005/6 to 2012/13

Sources: Calculations from Logistics Unit annual reports, Nakhumwa (2006).

Late delivery of stocks meant that there were none of the storage problems with deliveries as faced in previous years (with insufficient SFFRFM depots space to accommodate incoming stocks).Figure 4.4 shows cumulative deliveries to depots and 'uplifts' from depots to markets for each year of the programme, as a percentage of total parastatal sales (cumulative sales data have not been available since 2011/12 following the discontinuation of monitoring of market sales by an independent monitor).Comparison of 2012/13 with earlier years shows that volumes and percentages of deliveries to depots in 2012/13 lagged considerably behind previous years in September and October (the best achievements being in 2009/10 and 2010/11) though by end November volumes (but not %s) had caught up with 2011/12 and were ahead of 2011/12 by end December. Uplifts from depots to markets were broadly in line with 2011/12, and slightly ahead by end December, but some way behind 2009/10 and 2010/11 performance. Early depot deliveries in 2007/8, 2008/9 and 2009/10 all benefited from significant stock brought forward from the previous season, so the early deliveries in 2010/11 were particularly noteworthy.

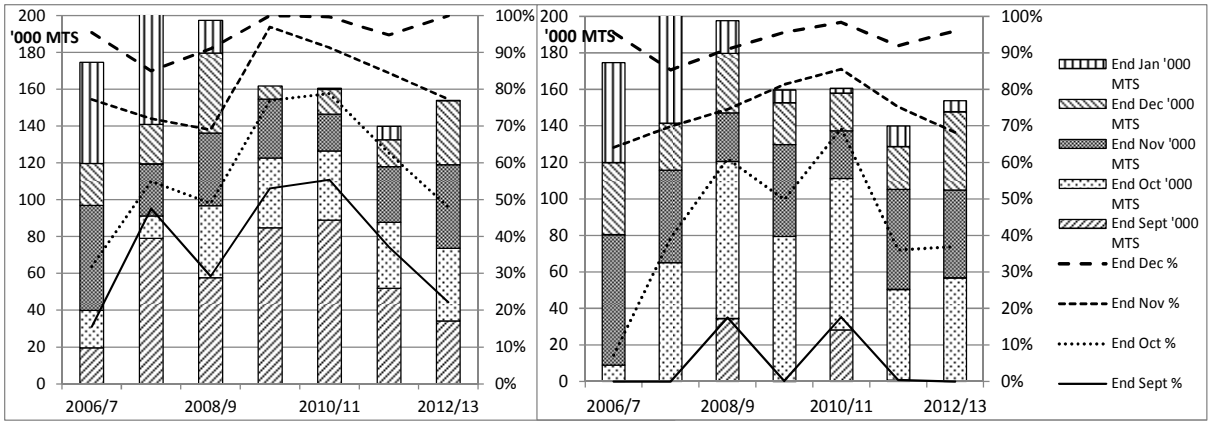

Figure 4.4 Cumulative deliveries to and 'uplifts' from depots by month 2006/7 to 2012/13
(% of final parastatal sales by end each month)
Source: Calculations from Logistics Unit annual and weekly reports

Limited uplifts (less than 40%) by the end of October are a matter for concern as this is critical for early planting and fertiliser application and to reduce travelling difficulties and demands on farmers' valuable time once the rains have come. Early fertiliser availability is particularly critical for NPK and in the Southern regions where the rains generally come earlier. Figure 4.5 therefore shows the % of NPK and Urea deliveries to and uplifts from depots by region by month. This shows that at the end of October in % terms NPK deliveries in the South were lagging behind NPK deliveries in the Centre, which in turn lagged behind those in the North, while in all regions NPK and Urea deliveries were roughly at par. By the end of November NPK and Urea deliveries were roughly even in all regions (with NPK slightly ahead in the South). However around 25% of NPK deliveries were still outstanding in the South and in % terms the South still lagged behind the Centre which lagged behind the North. Similar patterns are found for uplifts, with some lags, as would be expected. However at the end of November more than 35% of NPK uplifts were still outstanding in the South. Late rains in many parts of the South may have reduced the worst effects of late NPK delivery, but it will still have led to disruption of farmers' other activities, and more crowding and queues during input sales, and late rains cannot be relied on.

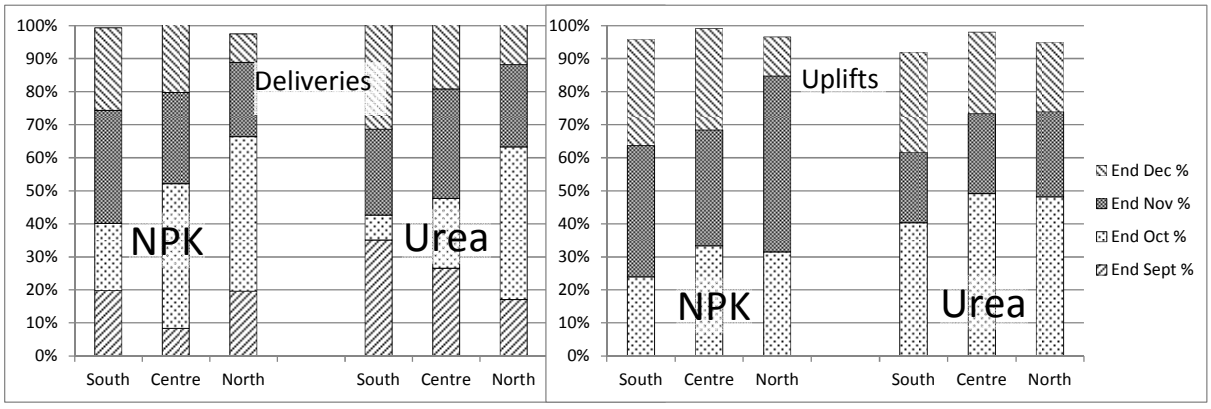

Figure 4.5 Cumulative deliveries to and 'uplifts' from depots, 2012/13 by region by month
(% of final parastatal sales by end each month)
Source: Calculations from Logistics Unit annual and weekly reports

The primary reason for late deliveries and uplifts in 2012/13 appears to have been late tender awards, as described above. However the lack of any improvement in delivery and uplift timing since

2009/10, with increased delays after 2010/11 (i.e. in the last two seasons, for different reasons) must be a matter for concern given the importance of early access to inputs by farmers.

It is, however, also important to note that farmers' access to inputs is not determined solely by the timing of fertiliser deliveries to depots and markets. Figure 4.6 sets out the range of activities involved in the implementation of FISP.

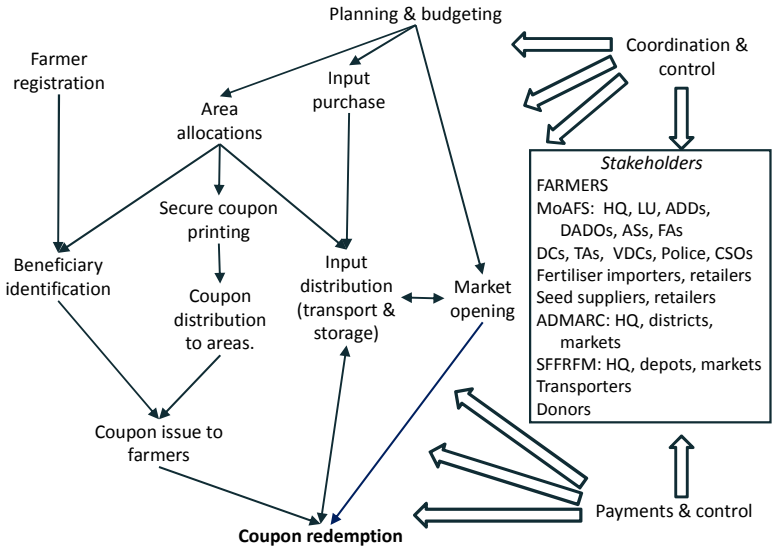

Figure 4.6 Critical activities in FISP implementation

This shows that prior to coupon redemption there needs to be coupon issue to farmers (with prior issuing of coupons which depends upon farmer registration and beneficiary identification as well as secure coupon printing and distribution), input procurement and distribution (which includes for fertilisers contracting and coordination of transport from depots to markets), and the opening of markets. These interact, and delays in market opening or coupon issues, for example, lead to storage problems at markets which can then lead to backing up of transport and storage problems at depots. Figure 4.7 therefore presents the timing of some of these other critical activities in 2012/13 (in bold) in comparison with previous years (with earlier, i.e. lower in the graph, being better). Although information is not available on the timing of voucher printing in 2012/13, late awarding of fertiliser tenders has been discussed above, while voucher allocations and the despatch of lists to districts was initially proceeding in good time but was then delayed by the late allocation of extra inputs and vouchers. Seed supply tenders contact tenders were, however, finalised in good time. Late opening of markets has also been a contributory factor in previous years: it is not clear how far this was an issue in 2012.

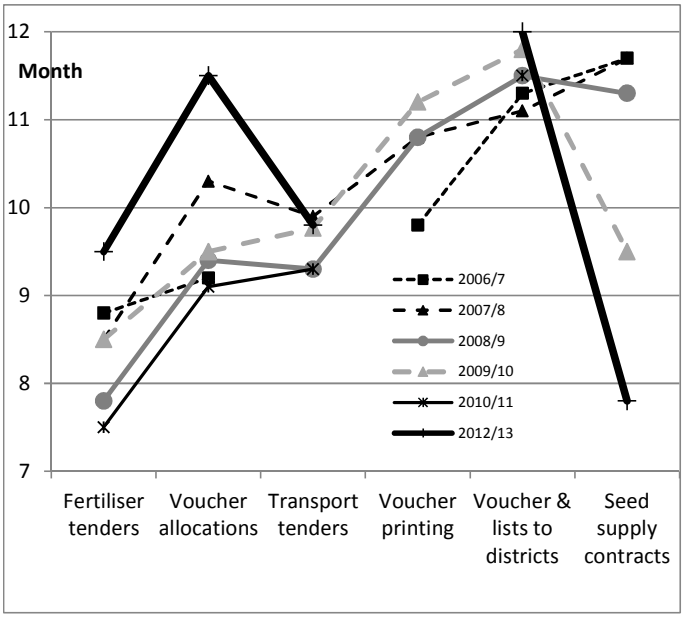

Figure 4.7 Timing of completion of contracts & voucher processes
Source: Calculations from Logistics Unit annual and weekly reports

There were significant concerns regarding security and monitoring of fertiliser while being transported from depots to markets. This was raised with the evaluation team in September and a monitoring system involving mobile phone communication between depots, markets and a coordination centre was proposed. This was not implemented but continuing concerns led to the trial of a similar system involving ESOKO and funded by USAID. Logistics Unit (2013) notes that in the transport tender awards there was a large increase in the number of different transporters who were awarded contracts (from between 23 to 26 in the previous four years to 43 in 2012/13), and that it appeared that some of these companies were actively engaged in theft of supplies being carried. Failures to conduct proper checks on vehicles when loading at depots also led to some theft by unauthorised vehicles. Logistics Unit (2013) estimates that a total of 608 MTS of fertiliser was lost or stolen in transit, and after recovery of some monies for this (MK48,383,912), financial losses amounted to MK109,787,088. These losses must however be considered as under-estimates given the potential for thefts by transporters to be linked with other fraudulent practices regarding coupon distribution and markets' stock control. The ESOKO system appears to have considerable potential for improving monitoring and control of fertiliser transport and market stocks and sales. It needs, however, to overcome challenges as regards mobile phone signal coverage, market clerks' access to and use of air time, consistent integration with wider management and stock control systems (see ESOKO reports), and challenges in setting up the system each year with temporary markets.

Logistics Unit (2013) notes the following:

- There is a need for pre-qualification of those wishing to tender for supply of fertilisers, to ensure that awards are only made to bona fide suppliers.
- The bid validity period should be reduced to 30 days and awards made within that period. This should reduce price hedging and cut costs
- Bid documents should set out required delivery times and request bidders to indicate specific delivery periods for the tonnage they supply, and supplier failures to meet their own stipulated delivery periods should then attract specified penalties.

- Payment processes should be revised, with suppliers being reimbursed in Malawi Kwacha at the current rate of exchange for the US dollar (the currency in which bids are submitted)with payment of a specified percentage in dollars to an external account
- The tender process for transporters should be tightened up, with evaluation of evidence of capacity and performance, vehicle availability and financial resources.
- Earlier development of a 'delivery matrix' for fertiliser allocation and despatch to markets

There continue to be significant delays in payment of invoices from seed and fertiliser suppliers, and these raise suppliers' costs and hence pricing to the programme. Figure 4.8 shows significant delays in payment in November and December, measured in terms of both absolute and percentage amounts owing. The 2012/13 absolute figures in Malawi Kwacha are inflated by the effects of the devaluation of the Kwacha, but outstanding invoices in November and December are also very high in percentage terms. These raise financing costs for suppliers and will be built into prices in tender bids. Payments by the end of January were, however, much improved, although outstanding claims due to changes in exchange rates between the time of invoicing and payment are not reported.

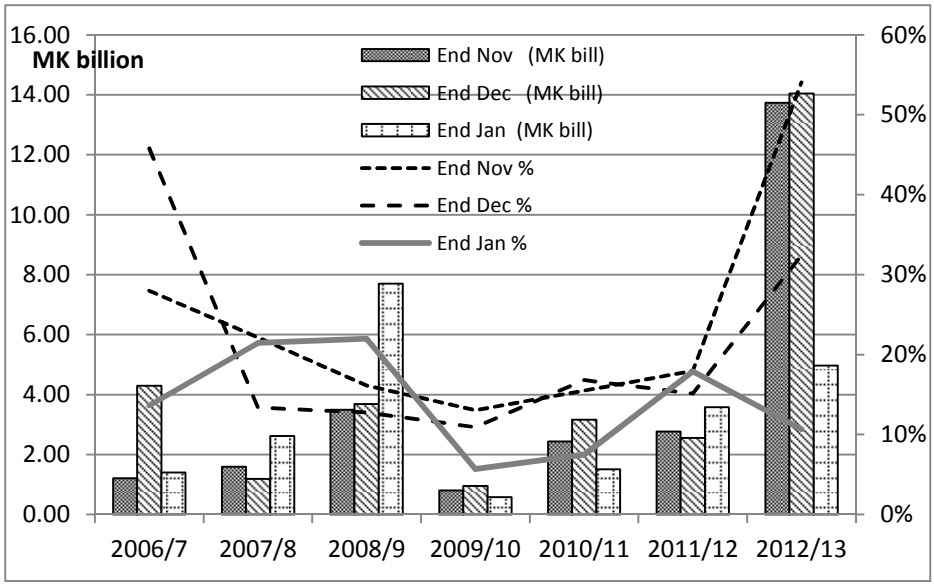

Figure 4.8 Outstanding invoice payments by season
Source: Calculations from Logistics Unit annual and weekly reports

4.2 Seed procurement

Seed companies and government agreed that farmers should be able to buy maize seed with a seed coupon with a maximum MK150 cash top up from farmers, and that these coupons would be redeemed by government for a price of MK 2,650 /coupon. Seed companies were responsible for stocking retail outlets (agro-dealers, input supply shops, and ADMARC and SFFRFM markets) with 5kg packets of hybrid seed, 8kg packets of OPV seed and 3 kg packets of soya seed and 2 kg packets of other legume seed (beans, cowpeas, pigeon peas, or groundnuts) for redemption by farmers, with redemption by government at a price of MK1250 per voucher. Retailers returned coupons to seed companies who were responsible for claiming reimbursement from the Government (through the Logistics Unit).

4.3 Coupon printing, allocation and distribution

Coupon allocation involved updating the farm households register, local (village) processes of selection of beneficiaries, allocation of coupons by district and within district by EPA, printing of coupons, distribution to districts, and issue of coupons to beneficiaries. These activities are critical as regards coordination of numbers of beneficiaries identified, coupon printing and issue, and allocation and transport of fertiliser supplies to markets, with total demand matching fertiliser procurement.

Registers of farm households in all districts were updated in the field from March to August and then cleaned by the Logistics Unit and sent back to districts for checking. This information formed the basis of an initial district allocation of coupons in mid-July with four coupons per beneficiary to allow each beneficiary to receive a set of subsidised inputs consisting of one hybrid or OPV maize seed pack (5 or 8 kg), one 50 kg bag of NPK, one 50 kg bag of urea, and one legume seed pack. District allocations were subdivided by EPA and village using the farm family register in each district, and the EPA and village allocations were distributed to DADOs together with blank registration forms for entry of beneficiary names. This allowed beneficiary identification to start in each district as soon as the farm family register was finalised. However district allocations were increased somewhat on 2nd November, requiring updating of the beneficiary lists in a number of districts. As a result beneficiary selection was not completed by all districts until the last week of November. Beneficiary lists were then printed by the Logistics Unit with beneficiary details by village and sent in triplicate to MoAFS, and summaries of fertiliser requirements by market compiled. Table 4.2 shows beneficiary registrations by region.

Table 4.2 Final Beneficiary Registrations by Region (Households)[1]

	Target	% by Region	% Male headed	% Female headed	Unallocated
North	199,500	13%	33%	57%	10%
Centre	636,400	41%	40%	59%	1%
South	708,500	46%	50%	48%	2%
Total	1,544,400	100%	44%	54%	2%

Source: Calculations from Logistics Unit (2013)

As in previous years there is some unevenness in allocations between districts and regions when compared with estimated population. Figure 4.9 compares changes in fertiliser voucher redemption by region per household over the life of the programme, using MoAFS farm family and NSO rural household estimates (note that in 2012/13 each registered beneficiary was supposed to receive two fertiliser vouchers).

[1] It should be noted that it may not be clear if the beneficiary listing distinguishes between male and female heads or male and female recipients.

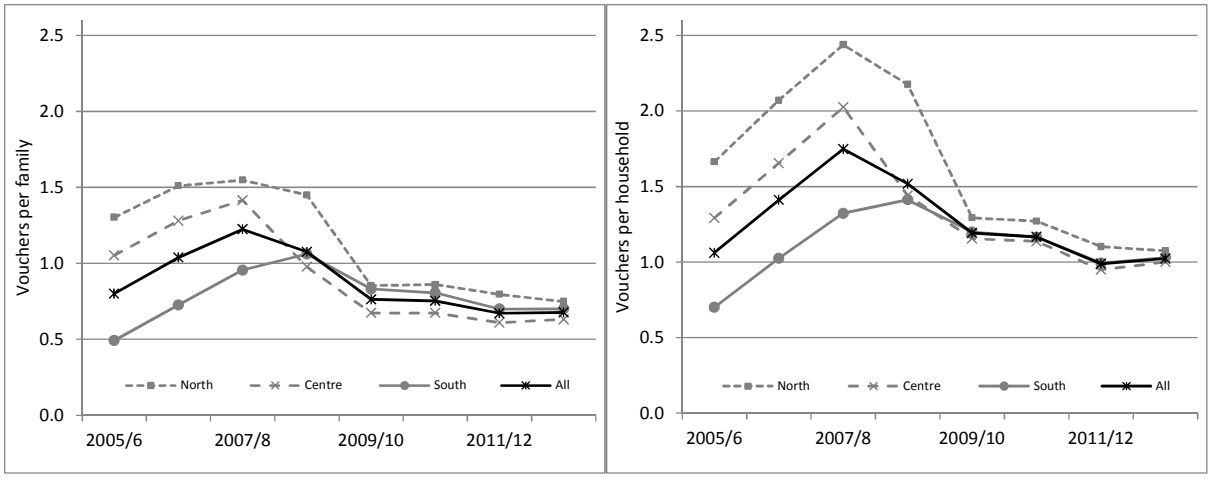

Figure 4.9 Estimates of fertiliser voucher redemption per household by region by year using MoAFS farm family estimates (left) and NSO rural household estimates (right)
Source: Calculations from Logistics Unit annual reports, NSO(2008).

The following observations are of interest from Figure 4.9:

- There have been significant differences in fertiliser supply over the life of the programme, with it rising from 2005/6 to 2007/8, and then falling back to 2009/10, with roughly similar supply in subsequent years. Overall fertiliser redemptions per NSO rural household in 2012/13 are roughly the same as they were in 2005/6, the first year of the programme, but are lower than in all subsequent years except 2011/12. Redemptions per MoAFS farm family are lower than in 2005/6.
- There are marked differences between supply per farm family registered by MoAFS and supply per rural household estimated from NSO census figures, with supply per MoAFS farm family much lower than supply per NSO rural household. This is because MoAFS national farm family estimates are just over 60% higher than NSO rural household estimates. This difference is lower in the southern region and highest in the Central region. MoAFS figures show more farm families in the Centre than the South.
- Both MoAFS and NSO estimates show differences in availability per household between regions, with these regional differences declining over time. Availability has been highest in the north in all years, but increasing regional equity has meant that supply to the north declined sharply from 2008/9 to 2009/10. Supply per MoAFS farm family in the central region also shows a very sharp decline form 2007/8 to 2009/10, below supply in the southern region, but supply per NSO rural household is now almost identical for the two regions. The low supply per MoAFS farm family in the central region in recent years is due to very rapid increases in MoAFS central region farm family registrations over the period compared with the southern region

Although commendable rough balance in coupons per rural household or farm family appears to have been achieved across the three regions, this does not appear to be the case across districts, as shown by Figure 4.10, which compares 2012/13 coupon allocations per registered farm family across districts. Allocations vary from less than 20% of farm families being registered beneficiaries in Chikwawa and Nsanje, and then a range from just over 30% to 55% of farm families being registered beneficiaries in the rest of the country. The reasons for some of this variation may be inferred (for example lower allocations to Chikwawa and Nsanje may be associated with farmers' perceptions that their soils are more fertile and hence common anecdotal reports of large scale sales of subsidised fertiliser from these districts). Variations between other districts are not so easily explained, and even where there may be agronomic and administrative reasons for such variation, it

is not clear how they fit in with programme objectives, targeting policies, and local expectations of equitable benefits.

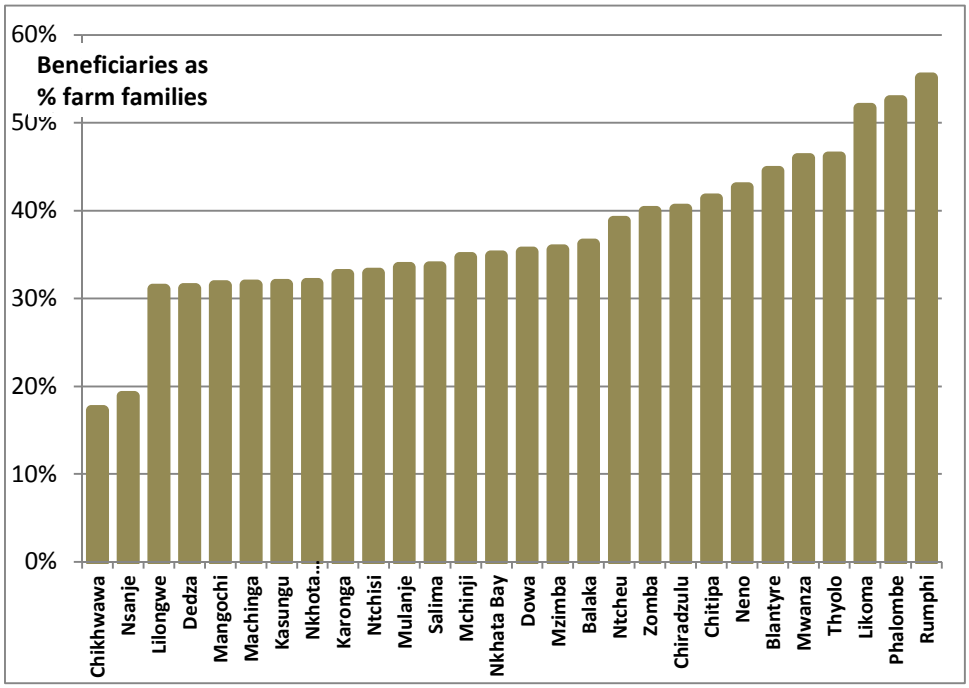

Figure 4.102012/13 District coupon allocations: registered beneficiaries as a % of registered farm families

Source: Calculations from Logistics Unit (2013)

Coupon distribution and access depended on the implementation of the formal allocation processes described above. Coupons were despatched to districts and bundled by EPA and village. Tight security measures were followed to the extent that no details of the coupons were released prior to the opening of the programme on 6thNovember. There is no evidence that fertiliser coupon distribution exceeded the formal allocations detailed above (a situation that arose with the issuing of supplementary coupons from 2006/7 to 2008/9), and general agreement that the security features of the coupon were generally effective in preventing fraud.

4.4 Coupon redemption and input sales

Fertiliser coupons had to be redeemed by beneficiaries at ADMARC or SFFRFM markets with the payment of MK500. Seed coupons could be redeemed (without payment or for up to MK150 for hybrid and some OPV packs) at agro-dealers and other input sellers who had made arrangements with seed suppliers for seed coupon redemption, as well as at ADMARC or SFFRFM markets. Sales occurred when suppliers had stocks and beneficiaries had coupons Reported fertiliser and seed sales are detailed in table 4.3.

Table 4.3 Subsidised fertiliser and seed sales

	Fertilisers (MT)			Seed ('000 packs)	
Region	NPK	Urea	Total	Maize	Legume
North	9,923	9,900	19,823	196	167
Centre	31,681	31,698	63,379	631	599
South	35,331	35,313	70,644	702	661
Total	76,936	76,910	153,846	1,529	1,427

Source: Calculations from Logistics Unit (2013)

With the seed coupons, farmers purchased 5,978 MT of hybrid seed and 2,667 MT of OPV seed, together with 2,973 MT of legume seed (comprised of 652 MT of beans seed, 41 MT of cow peas seed, 1,867 MT of groundnuts seed, 358 MT of soya seed and 56 MT of pigeon pea seed). Figure 4.11 shows how subsidised fertiliser and seed sales have changed over the life of the programme.

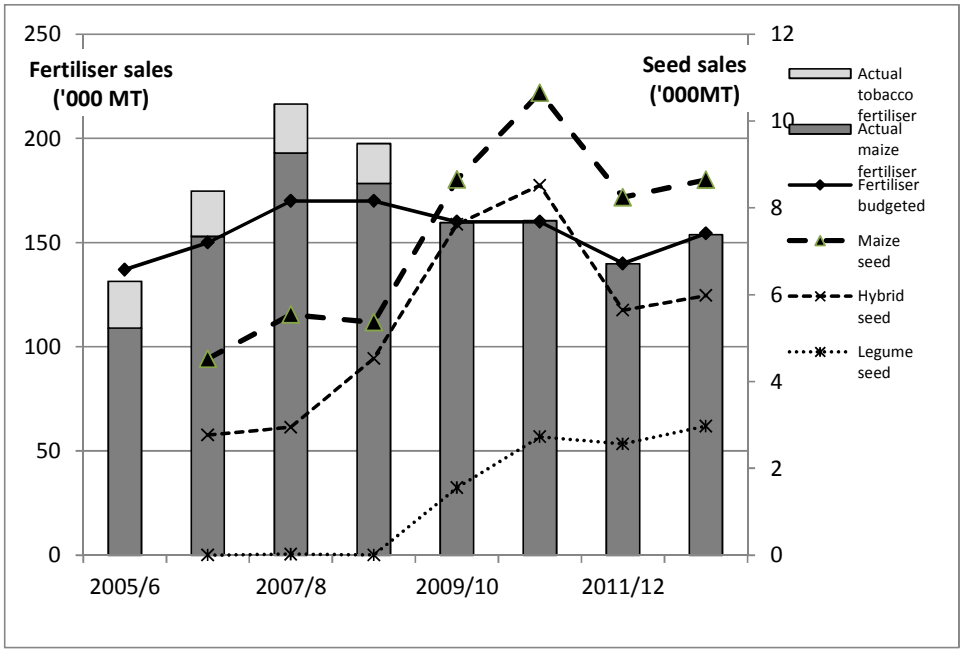

Figure 4.11 Subsidised fertiliser and seed sales by year

Source: Calculations from Logistics Unit annual reports

As figure 4.11 shows, there were large increases in maize and legume seed sales from 2008/9to 2010/11, with a subsequent fall back in sales of maize seed in 2011/12, but sustained legume seed sales. However, local shortages of particular legume seeds continue to constrain farmer choice and purchases.

We consider later (in sections 5 and 6) different stakeholders' perceptions of the implementation process, and estimates of coupon distribution and use for different categories of rural people.

4.5 Programme costs

Overall costs of the programme are difficult to estimate due to lack of documented administrative costs borne by the MoAFS and other organisations involved in the implementation of the subsidy. The available figures therefore reflect the documented costs of the programme. Figure 4.12 shows these with some added estimated costs in an attempt to estimated total programme costs. A detailed cost breakdown from which figure 4.12 is derived is available in Annex 1.

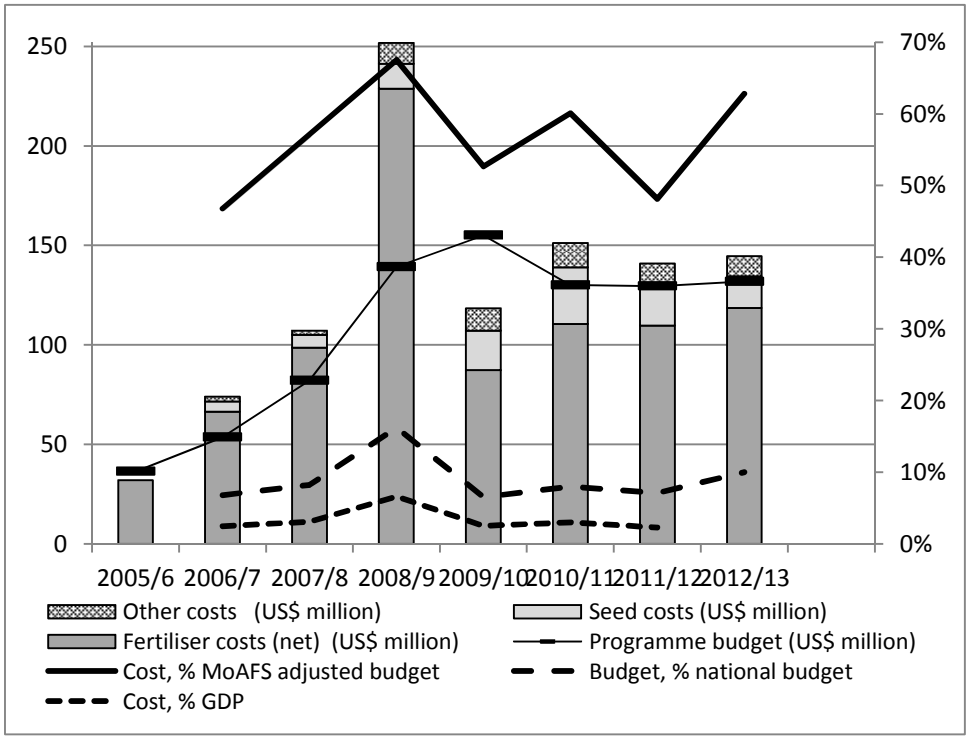

Figure 4.12 Trends in Farm Input Subsidy Costs, 2005/06 – 2012/13

Note: All costs are after deduction of farmers' redemption and include estimated costs.

Sources: Calculations from Logistics Units reports; previous evaluation reports

The following points should be noted regarding figure 4.12.

- Very high international fertiliser prices led to inflated costs in 2008/9, and this was exacerbated by poor physical control of voucher distribution from 2006/7 to 2008/9. Programme costs fell dramatically from 2008/9 to 2009/10 and 2010/11, due to reduced fertiliser prices and to improved control of subsidy volumes. These savings on fertiliser costs were offset to a very limited extent by increased volumes and costs of subsidised maize and legume seed.
- Data are presented in US$ because the major devaluation of the Malawi Kwacha in 2012 and early 2013 means that 2012/13 costs are not comparable with early years when the value of the Malawi Kwacha was relatively constant (at 140MK/US$ from 2005/6 to 2009/10, rising to 151 in 2010/11 and 167 in 2011/12). An exchange rate of MK365/US$ was used in converting MK budget and expenditure figures in 2012/13.
- The FISP Budget as announced in the national budget is for seed and fertiliser, and therefore should be compared with seed and fertiliser expenditure.
- The total cost of FISP in 2012/13 is estimated at just over or US$144 million or MK 52.8 billion.
- The cost of FISP is consistently estimated as over 50% of the MoAFS budget (this has been adjusted to allow for increases in FISP over-expenditure but not for other over-expenditures) and the FISP budget in the last three years has been between 7% and 10% of the national budget.
- Donors contributed to the 2012/13 FISP directly and through budget support. The direct support constituted 12% of the estimated total costs after deduction of farmer repayments

and covered costs of seeds, the logistic unit operating costs, coupon printing, support to the ACB and police, and monitoring and evaluation. Donors also supported the subsidy indirectly through budget support.

- Fertiliser procurement has accounted for an average of 77% of total programme costs over the 2011/12 and 2012/13 seasons. One reason for the high expenditure on fertiliser is beneficiaries' small contribution to fertiliser costs. Farmers' redemption payments for fertiliser have fallen from MK950 to MK500 over the life of the programme. As a result of these falls in Kwacha contributions together with increases in international fertiliser prices and the 2012 devaluation of the Kwacha, farmer contributions have fallen from approximately 35% to 3% of the cost of delivered fertiliser (including transport but excluding any overhead and administration costs).This dramatic fall is illustrated in figure 4.13.

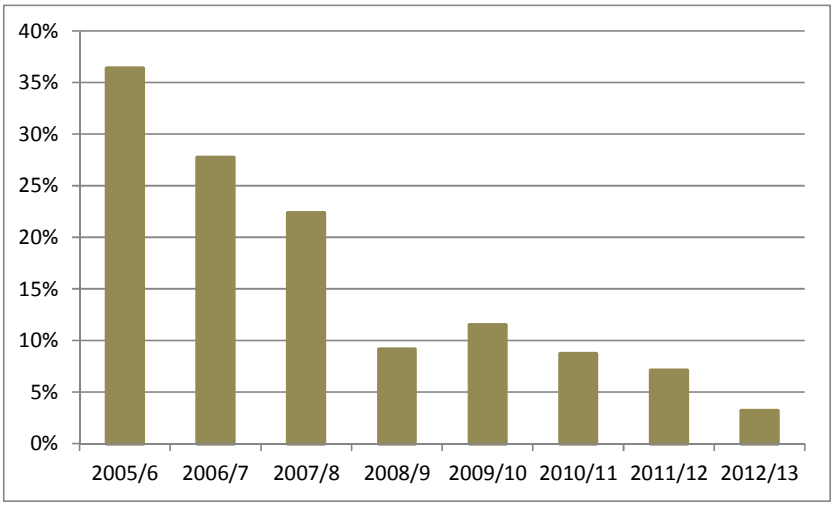

Figure 4.13 Beneficiaries' fertiliser redemption contributions as % total delivered costs, 2005/06 – 2012/13

Note: Delivered costs include procurement and transport costs but exclude administrative and overhead costs

Sources: Calculation from Logistics Units reports

- This high proportion of fertiliser costs in overall programme costs means that if net fertiliser costs can be reduced through improved tendering procedures, as discussed earlier in section 4.1, and/or through increased beneficiary contributions then there is considerable potential for reducing overall programme costs. For example a 5% reduction in fertiliser prices could reduce programme cost by just under 4% or some US$5.5 million or some MK2.0 billion. If in addition farmer contributions were raised to say (as an illustration)MK1500 per bag (around 10% of total cost), then this could save an additional US$8.4 million or MK3.1 billion. Taking these together could save around MK5.1 billion or US$14 million (just under 10% of total programme cost). Larger increases in beneficiary contributions could of course save more.

5 Impacts on the Private Sector

5.1 Introduction

This section reviews the impacts of the FISP on the private sector. It is based on the analysis of data from the input supplier survey and household survey. The focus is to review the performance of various players in the supply of agricultural inputs in the 2012/13 agricultural season. The input supplier survey was carried out in February/March 2013 in 10 districts (see section 3). Table 5.1 shows the sample distribution of input suppliers by district. In each district, the sample is dominated by independent agro-dealers, accounting for more than 50% of the input suppliers in the districts. The highest ADMARC/SFFRFM representation in the district samples was in Phalombe (38%), followed by Zomba (34%) and the lowest was in Dedza (3%), due to a high number of refusals for interviews. Nonetheless, these proportions are not necessarily representative of the distribution of suppliers in the district, but rather the suppliers that were available at the time of the survey. At the time the survey was being conducted, some of the suppliers had closed their seasonal market and the seasonal agro-dealers had also left the areas in which they were operating.

Table 5.1 Distribution of Sample Input Suppliers by District (%)

District	N	Distributor/ Importer	ADMARC / SFFRFM	Independent Agro-Dealers	Other Suppliers*	Total
Karonga	50	8.0	28.0	64.0	0.0	100.0
Mzimba	50	12.0	20.0	56.0	12.0	100.0
Kasungu	50	18.0	18.0	60.0	4.0	100.0
Lilongwe	50	22.0	26.0	52.0	0.0	100.0
Dedza	33	27.3	3.0	69.7	0.0	100.0
Mangochi	50	8.0	22.0	64.0	6.0	100.0
Zomba	50	10.0	34.0	56.0	0.0	100.0
Blantyre	50	6.0	10.0	74.0	10.0	100.0
Thyolo	47	6.4	21.3	72.3	0.0	100.0
Phalombe	16	6.3	37.5	56.3	0.0	100.0

Note: * Co-operatives and general wholesalers.

5.2 Characteristics of Input Suppliers

Table 5.2 presents the general characteristics of the input supply system. Overall, only 38% of the input suppliers operated throughout the year, 57% were only targeting rain-fed cultivation and 6% operated intermittently. We did not find cases where suppliers were only targeting *dimba* cultivation. There are district level variations in the timing of the operations, with the highest proportion operating throughout the year observed in Zomba (56%) and the lowest observed in Phalombe and Blantyre. The proportion of suppliers targeting only rain-fed cultivation is highest in Blantyre (76%) and Karonga (74%) and lowest in Thyolo (36%). These differences in the timing of operations are also reflected in the mean number of months the suppliers remain open: 6.8 months in the 2012/13 agricultural season, with Zomba recording the longest period and Phalombe recording the lowest period.

Table 5.2 Operational Characteristics of Input Suppliers by District

District	N	Years of Operation*	Timing of Operations (%)			Mean Number of Months of operation in 2012/13
			Year Round	Rain-fed only	Irregular	
Karonga	50	7.80	26	74	0	5.46
Mzimba	50	7.09	42	58	0	6.68
Kasungu	50	8.32	36	64	0	6.38
Lilongwe	50	8.79	52	44	4	7.98
Dedza	33	5.16	52	48	0	7.76
Mangochi	50	7.90	26	58	16	6.20
Zomba	50	6.58	56	44	0	8.24
Blantyre	50	3.10	18	76	6	5.50
Thyolo	47	5.54	47	36	17	8.21
Phalombe	16	6.08	6	63	31	5.31
Total	446	6.75	38	57	6	6.84

Note: * This variable had a lot of 'don't know' responses particularly for major distributors and parastatals and therefore understates the period of operation.

The operational characteristics by supplier categories are reported in Table 5.3 and show that it is distributors that mostly operate throughout the year. The suppliers that are mostly targeting rain-fed cultivation are independent agro-dealers (67%) and ADMARC/SFFRFM (56%). ADMARC/SFFRFM and agro-dealers operate for only half of the season while distributers service the farming communities for 11 months in the agricultural season. The private sector also generates higher employment, as reflected in the number of permanent employees among distributors and other suppliers. The independent agro-dealer system generates the lowest average permanent employment per operation. These figures show that providing incentives to distributors to sustain markets in the economy may have important employment benefits, although in comparing employment benefits with for example agro-dealers it may be better to consider turnover per staff member.

Table 5.3 Operational Characteristics of Input Suppliers by Supplier Category

Operational Indicator	Distributor/ Importer	ADMARC / SFFRFM	Independent Agro-Dealers	Other Suppliers*
Timing of Operations (%)				
Year Round	87	39	27	56
Rain-fed Only	9	56	67	38
Irregular	4	5	6	6
Mean operational months	11.0	6.5	6.0	8.4
Mean permanent workers	4.3	2.5	0.8	3.3
Mean temporary workers	0.4	1.8	0.9	0.5
N	***55***	***96***	***279***	***16***

Note: * Co-operatives and general wholesalers.

Most of the suppliers also sell other goods in addition to agricultural inputs (Table 5.4). Overall around 50% of annual sales come from non-agricultural input business among distributors, ADMARC/SFFRFM, and other suppliers, but just under 30% among agro-dealers. There is high diversification of goods sold among distributors, and this is consistent with the argument that to

support market operations throughout the year they need to cater for other needs of the rural communities.

Table 5.4 Other Goods Sold by Supplier Category (% outlets)

Non-Input Goods Sold	Distributor/ Importer	ADMARC / SFFRFM	Independent Agro-Dealers	Other Suppliers*
Groceries	89	2	21	69
Maize	40	75	12	0
Hardware and building materials	95	0	8	56
Clothing and house wares	33	0	7	56
Other non-input goods	29	58	5	0
N	***55***	***96***	***279***	***16***

Note: * Co-operatives and general wholesalers.

Table 5.5 shows the mean proportion of agricultural input sales accounted for by each type of input as reported by input suppliers. Among distributor outlets, 49% of agricultural input sales come from the sale of fertilizers and 26% come from maize and legume seed sales. Grain storage chemicals and agricultural equipment are also important sources of sales. ADMARC and SFFRFM mostly rely on fertiliser sales (92% of sales), with small maize and legume seed and no sales of vegetable seeds or feed stocks. Agro-dealers tend to specialize in maize and legume seed sales (accounting for 52% and 26%, of sales respectively). Fertiliser sales are not at all important among agro-dealers (contributing 6% of total agricultural sales). One likely reason for specialisation of agro-dealers in seed sales maybe relatively lower capital needs to invest in retail of seeds compared to the capital requirements for the fertiliser business.

Table 5.5 Proportion of Agricultural Input Sales in 2012/13 (%)

Inputs	Distributor/ Importer	ADMARC / SFFRFM	Independent Agro-Dealers	Other Suppliers*
Fertiliser	48.5	91.8	6.0	11.7
Maize seeds	17.8	6.8	51.9	52.6
Legume seeds	8.0	0.3	26.2	5.9
Vegetable seeds	1.3	0.0	3.8	3.6
Herbicides	2.9	0.4	3.0	0.5
Grain storage chemicals	7.4	1.7	4.4	14.5
Feed stocks	1.8	0.0	0.1	2.7
Agricultural equipment	8.3	0.2	1.9	14.3
N	***55***	***96***	***279***	***16***

Note: * Co-operatives and general wholesalers. The proportions do not add to 100 as these were averages based on the proportions reported by input suppliers.

5.3 Seed and Fertiliser Stock Flows

In the input supply survey, data was also collected for stock levels and movements of both subsidized and unsubsidized inputs. Table 5.6 shows the proportion of suppliers in each group that had stocks of various inputs for sale (subsidized and commercial) in the 2012/13 agricultural season. Overall, 85% of the input suppliers had stocks of maize seeds, 62% had stocks of legume seeds and 50% had stocks of fertilizers. Almost all the distributor outlets had stocks of fertiliser and maize seeds. There was also high incidence of stocks of grain storage chemicals (89%) and agricultural equipment (91%) among distributor outlets. ADMARC and SFFRFM mainly stocked fertilisers. Agro-dealers tend to specialize in maize and legume seeds, with 99% and 85% with stocks for the 2012/13

season, respectively. A high proportion of other suppliers also reported stocks of maize seeds (100%), grain storage chemicals (75%), agricultural equipment (56%) and vegetable seeds (43%).

Table 5.6 Proportions of Suppliers with Stocks in 2012/13 by Supplier Group (%)

Inputs	Distributor / Importer	ADMARC / SFFRFM	Independent Agro-Dealers	Other Suppliers*	All
Fertiliser	96.4	99.0	25.1	31.3	50.0
Maize seeds	98.2	34.4	98.9	100.0	85.0
Legume seeds	65.5	1.0	85.3	31.3	62.8
Vegetable seeds	27.3	0.0	34.4	43.8	26.5
Herbicides	49.1	2.1	25.1	12.5	22.6
Grain storage chemicals	89.1	10.4	34.8	75.0	37.7
Other chemical products	65.5	8.3	24.4	6.3	25.3
Feed stocks	12.7	0.0	1.1	12.5	2.7
Agricultural equipment	90.9	2.1	21.5	56.3	27.1
N	***55***	***96***	***279***	***16***	***446***

Note: * Co-operatives and general wholesalers.

5.3.1 Seed Stocks

The input supply survey obtained information on the stocks and flows of various seed types from input suppliers as a measure of business activities. Table 5.7 shows the stocks available for 2012/13 season and the amounts sold within the season by the type of supplier. There were still some stocks that were carried over from the 2011/12 season and sold in the 2012/13 season. However, when retailers were asked what they plan to do with the 2012/13 remaining seeds, 99% indicated that they will return to suppliers. ADMARC and SFFRFM mainly specialized in maize seed and the only legumes available in small quantities were groundnut seed and soya bean seed. There is, however, a general problem on the availability of legumes, and suppliers almost sold all the stocks within the season. Most of the legume seeds were available in agro-dealer shops. The low end of season balances for legumes reveal that there was possibly unmet demand in some areas.

Table 5.7 Mean Seed Stock Levels and Movements in 2012/13 (kilograms per supplier)

Stock	Distributor / Importer	ADMARC / SFFRFM	Independent Agro-Dealers	Other Suppliers*	Total
OPV Maize Seed					
Stocks - end of 2011/12 season	39	-	52	-	37
Stocks - acquisition in 2012/13	9,761	56	2,564	660	2,843
Stocks - sold in 2012/13	8,249	54	2,082	510	2,349
Stocks - end of 2012/13 season	447	2	353	150	282
Hybrid Maize Seed					
Stocks - end of 2011/12 season	79	81	115	168	105
Stocks - acquisition in 2012/13	1,271	478	7,491	5,307	5,136
Stocks - sold in 2012/13	1,009	183	5,987	4,290	4,063
Stocks - end of 2012/13 season	230	208	1,253	1,118	897
Bean Seed					
Stocks - end of 2011/12 season	3	-	0.03	-	0.4
Stocks - acquisition in 2012/13	2,233	-	461	51	566
Stocks - sold in 2012/13	2,173	-	444	51	547
Stocks - end of 2012/13 season	7	-	16	-	11
Groundnut Seed					
Stocks - end of 2011/12 season	-	-	-	-	-
Stocks - acquisition in 2012/13	144	3	1,173	540	772
Stocks - sold in 2012/13	140	3	1,154	540	759
Stocks - end of 2012/13 season	0.3	-	9	-	6
Pigeon Peas Seed					
Stocks - end of 2011/12 season	-	-	-	-	-
Stocks - acquisition in 2012/13	-	-	157	119	103
Stocks - sold in 2012/13	-	-	151	119	99
Stocks - end of 2012/13 season	-	-	3	-	2
Cow Pea Seed					
Stocks - end of 2011/12 season	-	-	-	-	-
Stocks - acquisition in 2012/13	34	-	60	25	42
Stocks - sold in 2012/13	34	-	56	25	40
Stocks - end of 2012/13 season	-	-	1	-	1
Soya Bean Seed					
Stocks - end of 2011/12 season	-	-	1	-	0
Stocks - acquisition in 2012/13	632	3	502	152	398
Stocks - sold in 2012/13	621	3	495	149	392
Stocks - end of 2012/13 season	9	-	7	3	6

Note: * Co-operatives and general wholesalers.

5.3.2 Fertilizer Stocks

Table 5.8 presents the average stock levels and sales per supplier of all fertilizers by type of retailer. There were substantial carryover stocks of fertilizers from the 2011/12 agricultural season, particularly in distributor outlets, averaging 22.9 tonnes in the 2012/13 season, and again at the end of the season. Most of the new fertilizer stocks were found in ADMARC and SFFRFM outlets, which is expected as most of the stocks are subsidized fertilisers due to the exclusion of the private sector

from in retailing subsidized fertilisers. The mean stocks of fertilizers were lowest among the independent agro-dealers, averaging 9.3 tonnes per agro-dealer.

Table 5.8 Mean Fertilizer Stock Flows per supplier in 2012/13 (tonnes)

Stock	Distributor/ Importer	ADMARC / SFFRFM	Independent Agro-Dealers	Other Suppliers*	Total
Stocks - end of 2011/12 season	22.9	1.7	0.1	1.9	3.3
Stocks - acquisition in 2012/13	117.4	205.7	9.3	15.6	65.1
Stocks - sold in 2012/13	108.3	204.0	8.9	16.1	63.4
Stocks - end of 2012/13 season	29.0	2.8	0.6	1.4	4.6

Note: * Co-operatives and general wholesalers.

5.4 Subsidized Seed and Fertiliser Sales

5.4.1 Subsidized Seed Sales

Overall, 83% of the input suppliers interviewed in the study participated in the sale of subsidized seeds in the 2012/13 agricultural season. Table 5.9 shows the participation in subsidized seed sales by type by supplier. Proportionately, there is lower participation in subsidized seed sales in ADMARC/SFFRFM market outlets with only 32% indicating that they sold subsidized seeds in the 2012/13 season. The highest participation was among agro-dealers (97%), followed by distributor outlets (95%). In terms of the reported incidence of farmers that brought coupons but also bought additional seeds on cash basis, very few suppliers reported that farmers were also buying with cash in addition to coupon purchases.

Table 5.9 Subsidized Seed Sales by Supplier Group (%)

Indicators	Distributor / Importer	ADMARC / SFFRFM	Independent Agro-Dealers	Other Suppliers*
Participated in subsidized seed sales (%)	95	32	97	81
% of farmers also with cash purchase	7	0.4	7	18
% of seed coupons submitted by January	98	93	94	96
% of seed coupons reimbursed	-	-	11	-
N	***55***	***96***	***279***	***16***

Note: * Co-operatives and general wholesalers.

Most suppliers had submitted subsidized seed coupons received from farmers to the head offices or to the respective seed companies by January 2013. Among independent agro-dealers only 11% of the submitted seed coupons were reported to have been reimbursed.

Table 5.10 shows the relative distribution of supplier groups' participation in sale of seeds using coupons. ADMARC and SFFRFM mainly sold hybrid maize seed, hardly any groundnuts and no bean, pigeon pea or cow pea seed. Agro-dealers show diversity in the seeds that they sold using coupons, from 16% in cow pea seed to 82% in hybrid maize. Distributors showed similar diversity, but with a lower proportion selling legume seeds.

Table 5.10 Suppliers Selling Seeds using Coupons by Supplier Group (%)

Seed Type	Distributor / Importer	ADMARC / SFFRFM	Independent Agro-Dealers	Other Suppliers*	Total
OPV maize seed	73.1	3.2	57.4	23.1	53.8
Hybrid maize seed	40.4	96.8	82.4	100.0	78.3
Bean seed	69.2	0.0	41.2	15.4	40.8
Groundnut seed	15.4	3.2	65.8	30.8	52.2
Pigeon pea seed	0.0	0.0	21.0	15.4	16.0
Cow pea seed	3.8	0.0	15.8	7.7	12.5
Soya seed	44.2	3.2	46.0	15.4	41.0
N	***52***	***31***	***272***	***13***	***368***

Note: * Co-operatives and general wholesalers.

Subsidized seed sales were a significant proportion of seed sales among retailers in the survey as shown in Table 5.11. Among distributor outlets, the lowest proportion of seed sales is in hybrid seeds averaging 67%, but all cow peas sales were subsidized sales. For ADMARC and SFFRFM, except for hybrid maize seed, all seed sales were subsidized sales. Similarly, most of the sales and almost all seed sales among other retailers were subsidized sales. Across the retailers, the lowest share of subsidized sales is in hybrid seed sales.

Table 5.11 Share of Subsidized Seed Sales in total (subsidy and commercial) sales(%)

Seed Type	Distributor / Importer	ADMARC / SFFRFM	Independent Agro-Dealers	Other Suppliers*	Total
OPV maize seed	84.3	100.0	93.4	100.0	91.8
Hybrid maize seed	68.7	88.2	81.8	75.4	81.2
Bean seed	97.1	-	97.8	100.0	97.7
Groundnut seed	88.3	100.0	97.8	100.0	97.5
Pigeon pea seed	-	-	98.9	100.0	99.0
Cow pea seed	100.0	-	99.8	100.0	99.8
Soya seed	94.3	100.0	97.7	100.0	97.3

Note: * Co-operatives and general wholesalers.

Table 5.12presents the maximum number of seed varieties sold in the subsidy programme in 2012/13 season. There was diversity among the private sector retailers, particularly for hybrid maize seeds where up to 11 hybrid seed varieties were sold by some retailers compared to only 3 in ADMARC and SFFRFM outlets. There was low diversity of varieties sold on legume and OPV maize seeds. Although there are a number of OPV maize varieties, the limited diversity suggests that farmers do have limited choices over the variety of seeds available.

Table 5.12 Maximum Number of Seed Varieties under Subsidized Sales (%)

Seed Type	Distributor / Importer	ADMARC / SFFRFM	Independent Agro-Dealers	Other Suppliers*	Total
OPV maize seed	4	1	4	2	4
Hybrid maize seed	10	3	11	8	11
Bean seed	2	-	2	1	2
Groundnut seed	1	1	2	2	2
Pigeon pea seed	-	-	2	1	2
Cow pea seed	1	-	1	1	1
Soya seed	2	1	2	1	2

Note: * Co-operatives and general wholesalers.

The choices available to smallholder farmers are further revealed from the data on the most popular variety sold and the most wanted variety by the farmers (Table 5.13). The most popular OPV maize seed in terms of sales is ZM 623. This is the first most popular variety among 55% of retailers and was also mentioned as the second most popular variety by 35% of retailers that mentioned two seed varieties. ZM 621 is the second most popular. With respect to hybrid maize seed, the most popular variety is SC 403, listed as most popular among 27% of retailers, followed by DKC 8053, MH 26 and PAN 53.

Table 5.13 Most Popular Maize Varieties under Subsidized Sales (%)

OPV maize seed				Hybrid maize seed			
Variety 1	%	Variety 2	%	Variety 1	%	Variety 2	%
ZM 623	54.5	ZM 623	34.8	SC 403	26.7	SC 627	25.8
ZM 621	17.7	ZM 621	21.4	DKC 8053	13.5	DKC 8053	19.4
ZM 521	9.1	ZM 523	18.0	MH 26	11.8	SC 403	10.6
ZM 523	7.1	ZM 721	9.0	PAN 53	10.4	PAN 67	9.7
ZM 721	3.5	ZM 521	3.4	SC 627	8.3	DKC 9089	7.8
Other (9)	8.1	Other (12)	13.4	DKC 9089	8.0	PAN 53	7.4
				SC 719	6.3	PAN 4M19	4.6
				PAN 67	5.9	SC 719	4.6
				PAN 4M19	1.4	FUMBA	1.8
				Other (16)	7.7	Other (13)	8.3
N	***198***		***89***		***288***		***217***

Table5.14 presents the structure of the seed market in terms of control of the market among seed producers. Demeter controls the market share in OPV maize accounting for 62% of the most popular varieties sold, followed by Funwe which accounts for 20% of most popular variety. This implies a two-firm concentration ratio of 82%. Similarly, there is high level of concentration in hybrid maize seeds, with Seed Co and Monsanto accounting for 42% and 25% of the most popular varieties, respectively. The three-firm concentration ratio is 87%. This market dominance suggests limited choices available to smallholder farmers. In fact, the number of seed breeders supplying to the subsidy programme increased marginally from 12 in 2011/12 to 15 in 2012/12 (Chirwa and Dorward, 2013b); (Logistics Unit, 2013)

Table 5.14 Most Popular Maize Varieties under Subsidized Sales by Seed Company (%)

OPV maize seed			Hybrid maize seed		
Company	First (%)	Second (%)	Company	First (%)	Second (%)
Pannar	-	2.2	Pannar	18.5	23.0
Seed Co	7.1	1.1	Monsanto	25.4	30.0
Seed Tech	1.5	3.3	Seed Co	41.8	43.8
Demeter	62.1	65.6	Seed Tech	3.1	1.8
Funwe	20.2	15.6	Demeter	0.7	0.9
Nasfam	5.6	3.3	Funwe	10.1	-
CPM Agri	0.5	-	CPM Agri	0.4	-
Panthochi	2.0	5.6	Other	-	0.5
Premium	1.0	3.3			
N	***198***	***90***		***288***	***217***

The problem of stock outs on subsidized seeds is also presented by type of retailer in Figure 3 below. Stock outs were mainly reported by private sector retailers. However, as noted above, ADMARC and SFFRFM did not have a lot of stocks of seeds in the 2012/13 season, with agro-dealers with the bulk of the seed stocks.

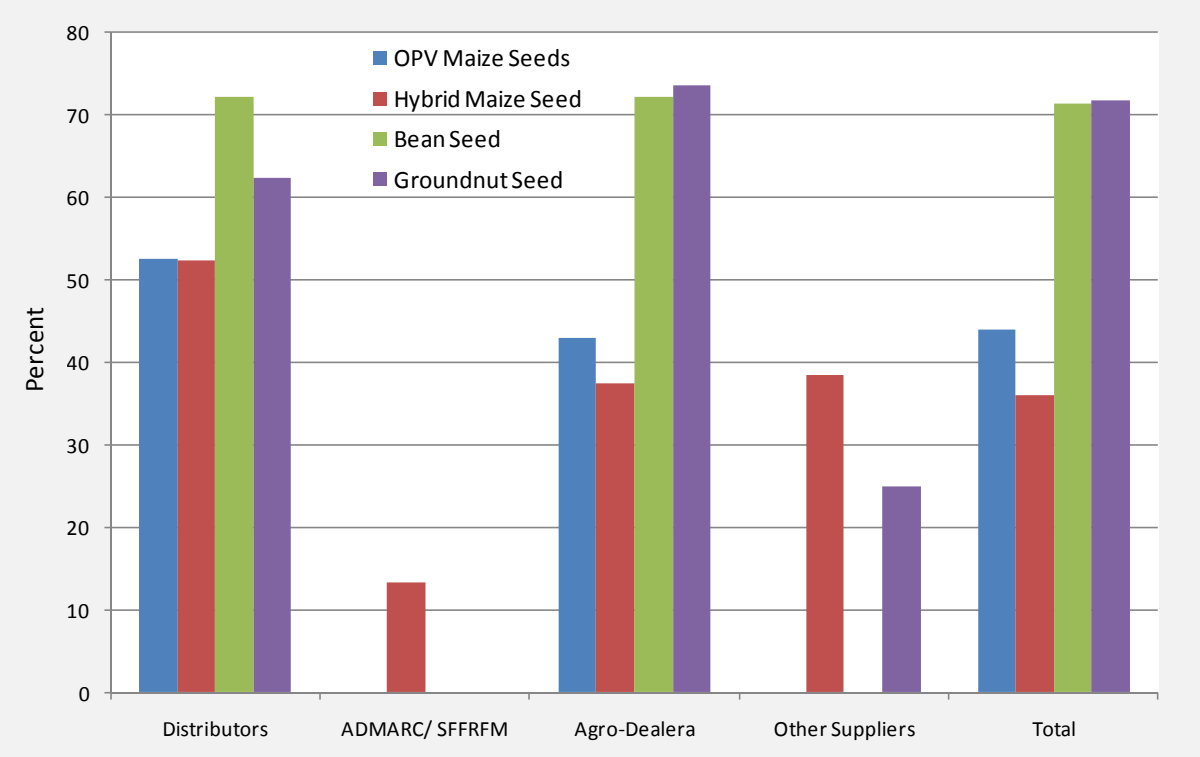

Figure 5.1 Incidence of Stock-Outs in Subsidized Seeds in 2012/13
(% suppliers by type)

The seeds were mostly obtained without a top-up, with a few exceptions. Top-ups were only paid by farmers for maize seeds bought at MK30 for hybrid maize seed at one ADMARC / SFFRFM outlet and at MK30 for OPV maize seeds at 6 agro-dealer outlets and MK20 – MK75 for hybrid maize seeds at 6 agro-dealer outlets.

5.4.2 Subsidized Fertiliser Sales

As in previous few years, the private sector did not participate in the retail of subsidized fertilizer sales in 2012/13. Survey data confirmed that only ADMARC and SFFRFM market outlets were dealing with subsidized fertiliser sales. The dominant subsidized fertilizer types sold were 23:21:0+4S/Chitowe (Basal) and UREA that was used for top dressing. On average 97,683Kgs and 104,020Kgs of basal and top dressing fertilizers were sold, respectively per outlet (Table 5.15). About 60 and 57% of the suppliers experienced some stock out of Chitowe and Urea fertilisers, with high variability across districts.

Table 5.15 Mean Volume of Fertilizer Sold per supplier and Incidents of Stock Outs in 2012/13

District	N	23:21:0+4S/ (basal) (Kg)	UREA (Top Dress) (Kg)	Experienced Basal stock-out (%)	Experienced Urea Stock- out (%)
Karonga	14	113,046	110,946	28.6	42.9
Mzimba	10	35,565	37,735	80.0	70.0
Kasungu	9	93,700	97,106	55.6	44.4
Lilongwe	13	128,762	137,765	84.6	76.9
Dedza	1	140,000	160,000	100.0	100.0
Mangochi	11	83,014	95,905	45.5	45.5
Zomba	17	100,185	109,553	82.4	64.7
Blantyre	5	88,350	78,530	20.0	40.0
Thyolo	10	112,675	131,840	40.0	40.0
Phalombe	5	99,910	99,600	80.0	80.0
Total	95	97,683	104,020	60.0	56.8

5.5 Commercial Seed and Fertiliser Sales

5.5.1 Commercial Seed Sales

We noted above that most of the seed sales were based on seed coupon redemptions by farmers. Very few suppliers sold seed for cash in the 2012/13 agricultural season. On average, only 18% and 46% of retailers covered in this study sold OPV and hybrid maize seeds for cash, and almost no retailers sold cow pea and soya bean seed for cash. Figure 6 shows the proportion of suppliers in the sample that sold seeds for cash. The highest proportion of retailers reporting cash seed sales is among 'other suppliers' with respect to hybrid maize seed, in which 87% reported cash sales. Among distributor outlets, 68% and 38% reported selling OPV maize and hybrid maize seed for cash, respectively. For agro dealers, a higher proportion reported selling hybrid maize seed for cash (60%) and 27% for OPV maize seed.

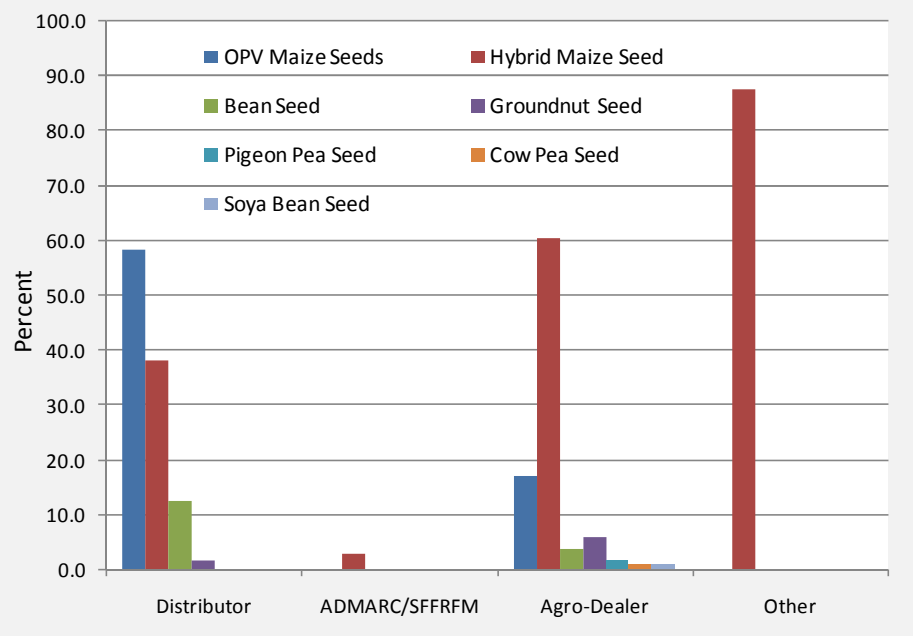

Figure 5.2 Proportion Selling Commercial Seeds (%)

Table 5.16 shows the average prices at which various types of seeds were selling in the 2012/13 season. On average, OPV maize seeds were selling at MK362 per kilogram, but the average price ranges from MK347 in Zomba to MK406 in Kasungu. Hybrid maize seeds were selling at an average price of MK576 per kilogram, with an average price range from MK536 in Karonga to MK632 in Mangochi. Bean, Groundnuts and Pigeon pea seeds were selling at MK614, MK629 and MK615 per kilogram, respectively. Soya bean seeds were selling at an average price of MK495 per kilogram with a range of MK471 in Karonga to MK529 in Mangochi.

Table 5.16 Average Prices of Seeds by District (MK per kilogram)

District	OPV maize seed	Hybrid maize seed	Bean seed	Ground-nut seed	Pigeon pea seed	Cow pea seed	Soya seed
Karonga	355	536	575	617	-	300	471
Mzimba	350	579	700	708	-	-	517
Kasungu	406	572	700	650	613	625	467
Lilongwe	350	589	493	582	-	-	404
Dedza	348	588	-	600	-	-	-
Mangochi	354	632	625	625	625	625	529
Zomba	347	564	613	613	-	-	-
Blantyre	351	572	625	613	600	-	-
Thyolo	388	566	581	-	-	-	497
Phalombe	378	578	625	-	-	-	-
All	362	576	614	629	615	517	495

5.5.2 Commercial Fertiliser Sales

Table 5.17 depicts the amount of fertiliser sold commercially by various suppliers. Evident in the data is the highest amounts of fertilizer sold commercially by distributor/importers especially for all fertilizer types. ADMARC/SFFRFM registered their highest sales for CAN fertilizer while Independent Agro-dealers registered the lowest cash sales, of D Compound fertilizer. On average more 23:21:0+4fertiliser was sold commercially followed by Urea then CAN.

Table 5.17 Mean Volume of Commercial Fertilizer Sales in 2012/13 (kilograms)

Fertilizer Type	Distributor/ Importer	ADMARC / SFFRFM	Independent Agro-Dealers	Other Suppliers*	Total
23:21:0+4S/Chitowe (Basal)	45,905	1,352	4,119	5,622	8,730
CAN	19,545	3,184	1,266	794	3,916
UREA (Top Dress)	34,710	911	2,813	4,753	6,407
D Compound	4,195	512	15	-	637
N	***55***	***96***	***279***	***16***	***446***

Table 5.18 below shows the proportion of suppliers that experienced fertilizer stock-outs by district and the average longest period of stock-outs. We find that an average of 40, 31, 34 and 21 percent reported stock-outs of basal, CAN, Urea and D Compound respectively. The longest stock-out days were reported in Blantyre of Basal/Chitowe and Urea for 60 days each and in Thyolo for 56 days of Basal/Chitowe fertilizer. However, on average the longest stock-out days ranged from 17 to 24 days. There is no consistent pattern across districts with respect to months with longest period of stock-outs in fertilizers for commercial sales in 2012/13. On average though longest stock outs were registered in May (CAN fertilizer), June (Urea fertilizer) and July (basal/Chitowe and D Compound fertilizer). However, these are less critical months of low demand. Most commercial sales were reported by suppliers for the months of June (Urea and CAN), August (basal/chitowe fertilizer) and in September (D Compound).

Table 5.18 Commercial Fertiliser Stock Out in 2012/13

District	23:21:0+4S/Chitowe (Basal)		CAN		UREA (Top Dress)		D Compound	
	Stock-out (%)	Mean Longest stock-out days	Stock-out (%)	Mean Longest stock-out days	Stock-out (%)	Mean Longest stock-out days	Stock-out (%)	Mean Longest stock-out days
Karonga	36.4	19	0.0	19	20.0	19	0.0	-
Mzimba	40.0	7	44.4	7	53.8	8	50.0	26
Kasungu	25.0	21	16.7	21	29.4	20	22.2	16
Lilongwe	54.5	17	38.1	17	39.1	13	0.0	-
Dedza	71.4	25	50.0	25	40.0	15	0.0	-
Mangochi	23.1	25	10.0	25	27.3	22	33.3	45
Zomba	47.4	31	35.3	31	33.3	26	36.4	18
Blantyre	33.3	60	0.0	60	16.7	60	0.0	-
Thyolo	21.4	38	25.0	38	28.6	14	0.0	-
Phalombe	0.0	-	0.0	-	0.0	-	0.0	-
All	40.5	23	30.5	23	33.6	17	21.3	24

Table 5.19 shows average prices of fertilizers per 50kg bag across the districts for different types of fertilisers. Overall, basal fertiliser was the most expensive at MK14 241 per 50 kg and CAN had the lowest average price of MK11 529 per 50 kg bag. There are district level variations but these are not substantial. For basal fertiliser, the average prices range from MK 13 200 per 50kg bag in Phalombe to MK15 841 per 50kg bag in Karonga. For urea, Thyolo had lowest average prices of MK13 146 per 50 kg while Karonga also turns up to have the highest price of MK15 435 per 50 kg bag. About 68 percent, 65 percent and 71 percent of the suppliers reported a price change of basal/chitowe and D Compound; CAN and Urea, respectively. There were slight declines in the average prices of basal, CAN and D Compound, but a slight increase in the price of Urea.

Table 5.19 Average Fertilizer Prices by District in 2012/13 (MK/50kg)

District	23:21:0+4S/ (basal)	CAN	UREA (Top Dress)	D Compound
Karonga	15,841	11,400	15,435	14,500
Mzimba	14,777	11,067	14,189	14,160
Kasungu	14,154	11,598	14,074	14,943
Lilongwe	13,756	11,168	13,771	13,324
Dedza	13,171	10,937	12,798	14,740
Mangochi	14,362	12,620	14,166	15,258
Zomba	14,162	11,647	13,635	13,936
Blantyre	14,292	14,267	14,342	14,700
Thyolo	14,386	11,460	13,146	13,160
Phalombe	13,200	9,500	13,800	12,500
All	14,241	11,529	13,850	14,211
Old Price	13,429	11,101	13,217	13,335

Figure 5.3 shows the commercial price of fertilizer across types of supplier during the 2012/13 farming season. In general average prices are above MK10 000, with CAN having the lowest average prices across the suppliers. Except for D Compound and other fertilisers, the lowest prices of basal, urea and CAN were found at ADMARC/SFFRFM outlets, followed by distributor outlets. Prices of fertilizer changed markedly during the 2012/13 farming season.

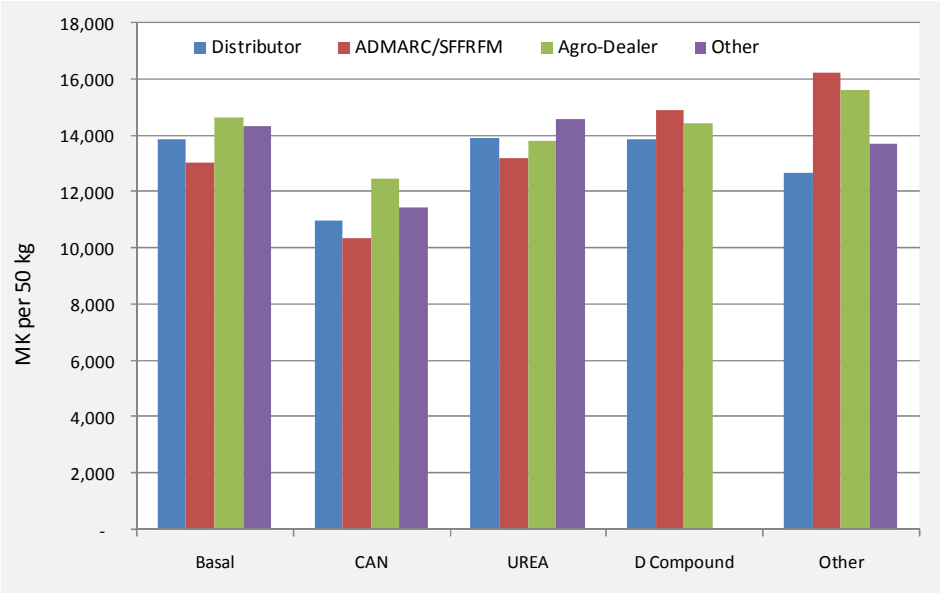

Figure 5.3 Price of Commercial Fertilizer per 50kg by Supplier in 2012/13

5.6 Performance of the Market System

5.6.1 Nature of Competition in the Input Supply System

The average catchment area of the input markets is 8.3 kilometre radius, with farmers reportedly travelled average distances of 13 kilometres to distributor outlets and within 7 kilometres of ADMARC/SFFRFM and independent agro-dealer shops. Figure 5.4 shows the number of competitors that input suppliers report face in their catchment area. From 2012 to 2013 there appears to be a general increase in the number of competitors that various suppliers are facing in both seeds and fertiliser markets, although the increases in the number of competitors are marginal. Consistent with limited fertiliser sales by agro-dealers, we also observe that seed retailers appear to face more competition than fertilizer retailers.

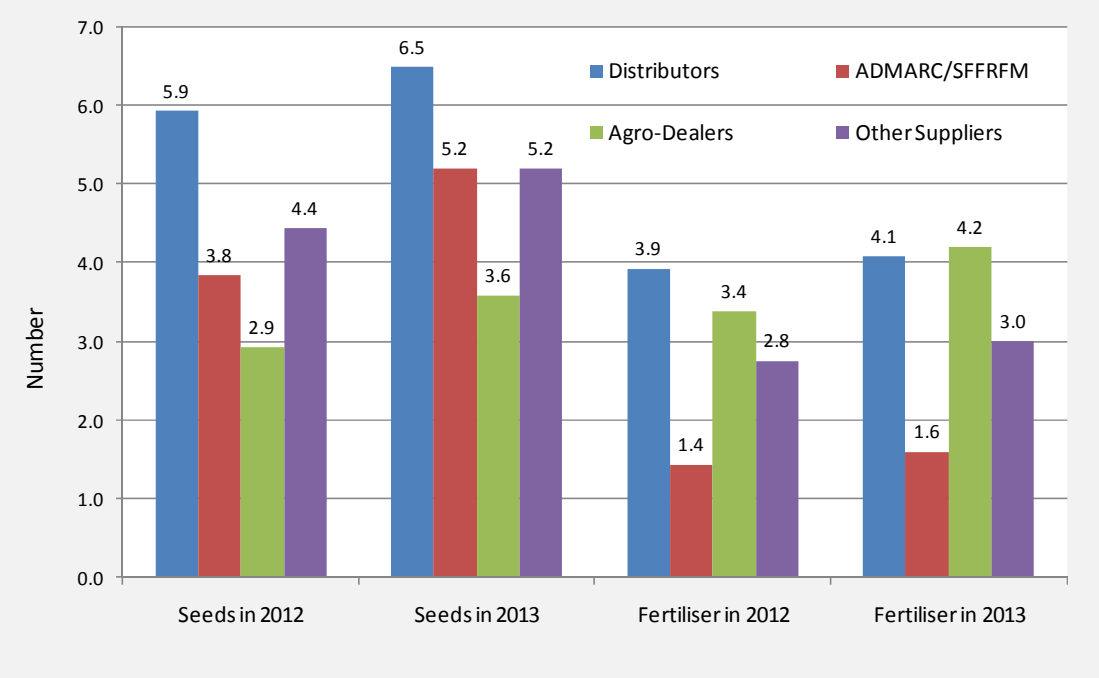

Figure 5.4 Number of Competitors in Seeds and Fertiliser Markets, 2011/12 - 2012/13

With respect to suppliers' perceptions of the type of competition they face, there are also variations in seed and fertiliser markets (Table 5.20). In the seed market, the main competitors are agro-dealers who are providing competition to all other suppliers and fellow agro-dealers. The parastatals are not the main competitors in the seed market. The participation of the private sector in the retailing of subsidized seeds may have helped in the development of the private sector although there are also questions about the sustainability of their businesses in the absence of the subsidy. As regards the fertiliser market, where the private sector has largely been excluded from the retail of subsidised fertilisers, ADMARC and SFFRFM remain important competitors to the private sector. However, distributors tend to face completion mainly from other distributors. This may be due to the fact that most of the distributor shops tend to locate at the same trading centres. ADMARC and SFFRFM tend to compete with each other, while for agro-dealers the main competition comes from distributor outlets. It may also relate to ADMARC/SFFRFM lower involvement in cash sales of fertiliser and to their limited and later opening in the season (see table 5.3).

Table 5.20 Nature of Competition Perceived by Supplier Group (% by column)

Competitors	Distributor / Importer	ADMARC / SFFRFM	Independent Agro-Dealers	Other Suppliers*
Seeds Market				
ADMARC/SFFRFM	5.6	6.3	2.0	6.7
Distributors	24.1	15.6	14.5	20.0
Cooperatives	1.9	-	1.2	-
Agro-dealers	68.5	78.1	82.4	73.3
N	***54***	***32***	***255***	***15***
Fertiliser Market				
ADMARC/SFFRFM	35.3	55.6	32.8	25.0
Distributors	56.9	37.0	41.8	50.0
Cooperatives	2.0	3.7	1.5	25.0
Agro-dealers	5.9	3.7	22.4	-
Supermarkets	-	-	1.5	-
N	***51***	***54***	***67***	***4***

Note: * Co-operatives and general wholesalers.

Suppliers were also asked about the growth of the business in terms of the number of sales outlets (opening or closing sales outlets). Figure 5.5 shows a mixed picture, with only 43% of distributors indicating expansion of sales outlets compared with 63% of other suppliers. Nonetheless, in each category of suppliers, the proportion that indicated increase in the number of sales outlets is higher than that with a decrease so that the net effect is an increase in input markets outlets between 2010/11 and 2012/13,particularly in the private sector. Most importantly, the increase in the sales outlets for agro-dealers is encouraging as they are servicing multiple markets and tend to reach farmers within more convenient distances, as observed earlier.

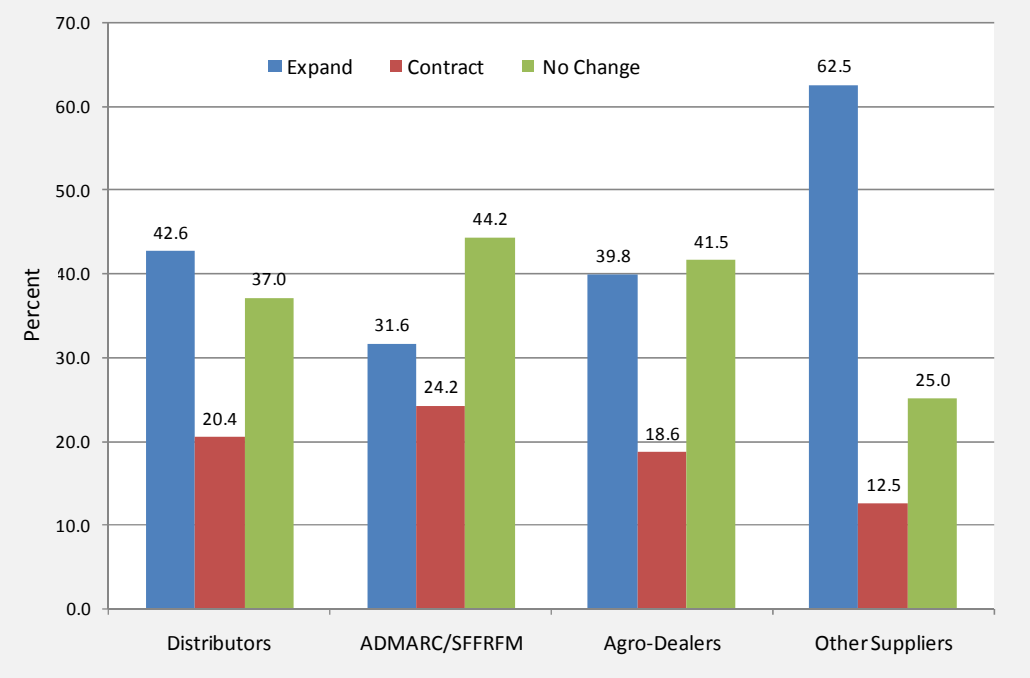

Figure 5.5 Growth of Business in terms of Number of Sales Outlets, 2010/11 - 2012/13

Among the distributors, 48% and 43% of those that indicated an increase in sales outlets attributed the change to increased demand for seeds and fertilisers and access to more capital for investments, respectively. For ADMARC and SFFRFM the increases were attributed to increase in demand for both seeds and fertilizers (47%) and another 47% attributed the change to increase in demand for fertilisers only. Among the agro-dealers, 34% attributed the increase in sales outlets to increased demand for seeds only while 24% pointed to more access to capital and another 24% pointed to the subsidy programme as having promoted sales. Overall, only 15% of retailers that indicated contraction of sales outlets blamed it on the displacement effects of the input subsidy programme. For agro-dealers, increased or high competition was the main reason provided for contraction of sales outlets (47%), followed by reduced demand for seeds only (30%).

5.6.2 Market Performance Assessment

In the 2012/13 agricultural season, one of the new features introduced to improve the transparency in the supply of inputs to farmers was the introduction of public beneficiary lists. In the survey, we asked retailers whether there was a beneficiary list publicly available at the retail outlet. About 92% of ADMARC/SFFRFM outlets reported that the beneficiary list was publicly available and 95% revealed that the list improved the overall conduct of business at the outlet. However, the proportion of outlets among the private sector that indicated that the list of beneficiaries publicly was available was marginal (less than 10%), no doubt partly due to the exclusion of the private sector in the retail of subsidized fertilisers.

We also reviewed the problems of queues and availability of preferred varieties at the sales outlets in the 2012/13 agricultural season. Table 5.21 shows that a higher proportion of independent agro-dealers (66%) reported long queues of farmers wanting to buy inputs; this was followed by ADMARC/SFFRFM with 52% of sales outlets reporting this problem. At district level, Kasungu had lowest proportion of markets (24%) reporting long queues while Phalombe reported the highest incidence (88%). There seem to have been major problems in the seeds varieties that were available to the farmers when they needed them, regardless of the type of input supplier. More than 75% of input suppliers revealed that they had some days that they had stocks of seeds but were unable to supply the specific type that a farmer wanted. The distribution of seed types partly depends on the marketing strategies of seed producers. The district level analysis revealed that most of the districts in the southern region had lower incidence of preferred variety stock outs (68%) compared to the central region (89%) and the northern region (88%).

Table 5.21 Problems of Queues and Preferred Varieties by Supplier Category

Indicators	Distributor / Importer	ADMARC / SFFRFM	Independent Agro-Dealers	Other Suppliers*
Some days with long queues of farmers	41.8	52.1	66.1	50.0
Some days without preferred seeds	85.2	75.0	79.1	75.0
Some days without preferred fertiliser	39.6	45.3	55.8	20.0

Note: * Co-operatives and general wholesalers.

With respect to fertilizers, we also note the mismatch between available stocks and the preferred types of fertiliser, more so among agro-dealers and ADMARC/SFFRFM. The lowest incidence of outlets reporting such problems was observed in Karonga (28%) and the highest incidence was observed in Dedza (88%). On average, 32%, 66% and 40% of retail suppliers reported fertiliser type mismatch with demand in the northern, central and southern regions, respectively.

5.6.3 Incidence of Fake Coupons

Most of the suppliers indicated that they had no problems identifying fake coupons. Overall, only 3.7% of retail outlets reported having problems identifying fake coupons, and mainly due to lack of facilities for identifying security features. Supply outlets were also asked about the incidence of presenting fake coupons for seeds in 2012/13 compared to 2011/12, and 67% indicated that there were no differences and 31% indicated less incidence in 2012/13. With respect to fertilizers, 76% indicated that there were no differences and 23% indicated fewer incidences of fake coupons in 2012/13.

5.7 Assessment of Subsidized Input Supply Systems

Table 5.22 presents the overall assessment of subsidized inputs supply systems in various seasons from 2010/11 to 2012/13. In the seed system, the ratings are 'good' to 'not good, not bad' and there appear to be slight improvements over time among distributor outlets, and agro-dealers. For ADMARC and SFFRFM outlets, the ratings suggest that the systems are becoming less impressive although are still considered 'not good, not bad'. The fertiliser supply system was rated poorly in 2012/13 compared to earlier years among private sector respondents. For ADMARC and SFFRFM, however, 2012/13 was considered good, and better than the previous years.

Table5.22 Assessment of Subsidized Input Supply Systems

Competitors	Distributor / Importer	ADMARC / SFFRFM	Independent Agro-Dealers	Other Suppliers
Seeds System				
2010/11	2.4	2.0	2.5	2.4
2011/12	2.3	2.2	2.4	2.1
2012/13	2.2	2.9	2.3	2.4
Fertiliser System				
2010/11	2.9	2.3	2.7	2.3
2011/12	2.9	2.4	2.8	2.7
2012/13	3.8	1.9	3.3	3.8

Note: Scores are 1= Very Good, 2=Good, 3=Not Good, Not Bad, 4 = Bad, 5=Very Bad

For the seed system, the good ratings among the 246 suppliers in 2012/13 season were mainly attributed to early implementation (48%) and efficient delivery of supplies (33%) while the system was deemed bad among 106 suppliers due to inadequate supplies (39%) and late implementation (27%). For the fertiliser system, the good ratings among the 105 input suppliers in the 2012/13 season was attributed to early implementation (37%)[2] and publicly available lists of beneficiary lists while those that rated the system bad (117 suppliers) attributed this to lack of private sector participation (38%) and inadequate supplies (36%).

Table 5.23 presents the views of the input suppliers on the future of the seed and fertilizer subsidy. With respect to seed subsidy, the dominant voice is to improve the timing of the implementation of the subsidy with just over 20%indicating that they would wish it was implemented earlier while a similar proportion pointed to the need to increase the number of beneficiaries, 16% were of the view that the package size should be increased and 17% proposed that the seed package should remain the same. With respect to fertiliser subsidy, 34% (43% among private sector) were of the view that the private sector should be allowed to participate retailing subsidized fertilisers while 26% were of the view that the number of beneficiaries should be increased. There is less support for

[2] This however contrasts with the analysis of timing of fertiliser distribution presented earlier in section 4.

allowing the private sector in the retail of subsidized fertilizers coming from ADMARC/SFFRFM outlets.

Table 5.23 Views on the Seed and Fertiliser Subsidy – Main Preferences for Change (%)

Indicators	Seed Subsidy			Fertiliser Subsidy		
	Parastatals	Private Sector	All	Parastatals	Private Sector	All
Package continue at same scale	9.6	18.9	16.9	10.4	5.5	6.5
Package should be reduced	1.1	1.4	1.4	1.0	-	0.2
Package should be increased	14.9	16.3	16.0	6.3	2.0	2.9
Should be better targeted	16.0	8.3	9.9	6.3	8.9	8.3
Change in number of beneficiaries	2.1	3.4	3.2	3.1	3.7	3.6
Increase number of beneficiaries	16.0	21.7	20.5	45.8	19.8	25.5
Decrease number of beneficiaries	-	0.6	0.5	1.0	0.6	0.7
Should be implemented earlier	24.5	21.4	22.1	17.7	11.5	12.8
Private sector should be able to retail	-	1.4	1.1	1.0	43.1	34.0
Other	16.0	6.6	8.6	7.3	4.9	5.4
Total	100.0	100.0	100.0	100.0	100.0	100.0

5.8 Assessment of Commercial Input Sales

One of the debated issues in the subsidy programme is the extent to which the subsidy promotes commercial sales by increasing adoption rates or displaces commercial sales by subsidizing smallholder farmers that would have purchased inputs at the market prices. We asked retailers to qualitatively assess the growth of commercial sales over the past 5 agricultural seasons, as reported in Table 5.24. For commercial seed sales, overall 44% of the supplier outlets reported a decrease in commercial sales and 28% reported an increase in commercial sales. ADMARC and SFFRFM reported the highest decrease (72%) followed by distributor outlets (56%) and agro-dealers have the lowest decrease (38%) in commercial seed sales. With respect to fertiliser sales, 36% reported an increase in commercial sales and 43% reported a decrease in commercial sales. The worst decreases in commercial fertilizer sales were reported among distributor outlets (56% of outlets) while the highest proportion of outlets experiencing increased sales were among agro-dealers (41% of the outlets).There is, therefore, a more mixed picture of how commercial sales have performed over the past five years.

Table 5.24 Changes in Commercial Sales in past 5 agricultural seasons

	Distributor / Importer	ADMARC / SFFRFM	Independent Agro-Dealers	Other Suppliers	All
Seeds Sales					
Increase	38	8	28	38	28
Decrease	56	72	38	44	44
No Change	6	20	35	19	28
N	***50***	***25***	***199***	***16***	***290***
Fertiliser Sales					
Increase	38	26	41	40	36
Decrease	56	49	31	20	43
No Change	6	26	28	40	21
N	***50***	***35***	***61***	***5***	***151***

The reasons provided for the changes in commercial seed and fertiliser sales are presented in Table 5.25. Among retailers that experienced increases in commercial sales, 54% and 20% attributed the increase to the business creation effects of the subsidy programme for seeds and fertiliser, respectively. However, for fertilizer sales, the main driver was the purchasing power of farmers through increased incomes coupled by improved farm produce prices and more retailers' business income. Subsidies are, however, a major factor that was attributed to the decline in commercial sales in both the seed and fertiliser market for those outlets that reported declining sales.

Table 5.25Reasons for Changes in Commercial Sales in past 5 seasons (%)

Indicators	Seed sales	Fertiliser Sales
Reasons for Increase		
Higher farmer income, can procure more supplies	19.5	16.4
Able to obtain credit from suppliers	2.4	-
Subsidy programme has created more business	53.7	20.0
Farmers had more money to purchase	14.6	40.0
Improved farm produce prices	4.9	14.6
Other	4.9	9.1
N	*82*	***55***
Reasons for Decrease		
Lack of credit/cash to purchase supplies	2.3	3.1
Subsidy programme has discouraged sale	61.7	52.3
High input prices	14.8	30.8
Farmers have no money for purchases	11.7	6.2
Unable to participate in the subsidy programme	2.3	1.5
Other	7.0	6.2
N	***128***	***65***

The data from the household surveys also provide insights in the development of the private sector. Figure 5.6 (a) shows that average hybrid and OPV seeds commercial purchases are higher in 2012/13 compared to the 2008/9 and 2010/11 agricultural seasons. Figure 5.6 (b) also shows that major increases in commercial purchases of seeds occurred in private sector outlets. This suggests that commercial seed sales have flourished under the subsidy programme.

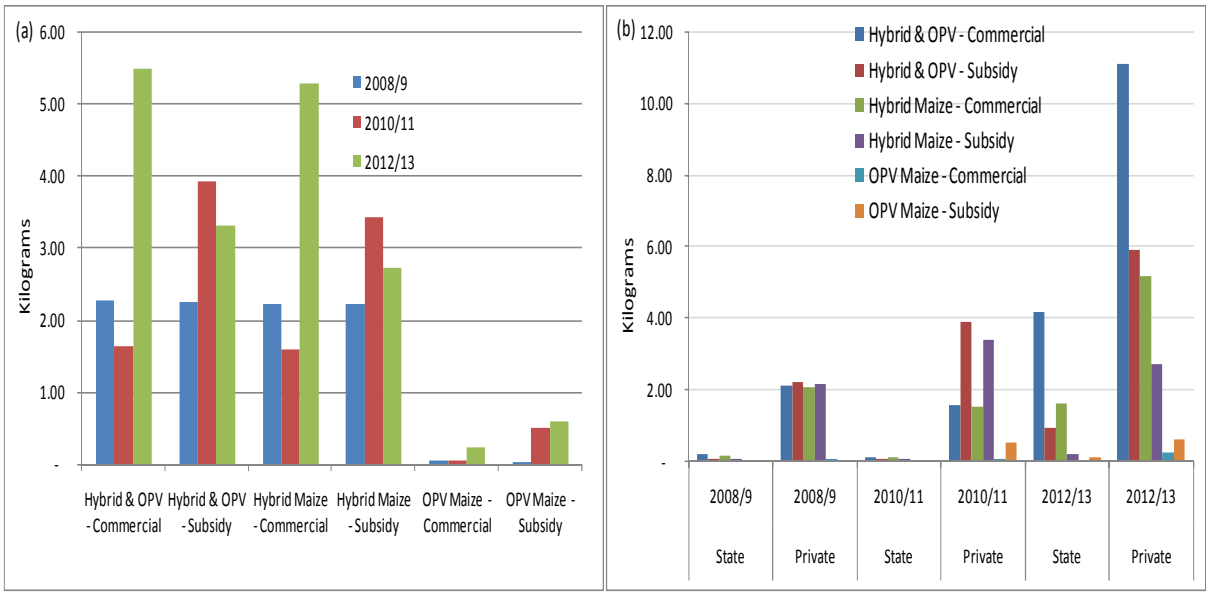

Figure 5.6 Mean Seed Purchases by Farmers, 2008/9 - 2012/13

Source:(Chirwa and Dorward, 2013a; Chirwa and Dorward, 2013b); Household Survey 2012/13

With respect to the fertilizer market, Figure 5.7, however, shows a more complex picture, with large increases in reported purchases from private companies between 2006/7 and 2010/11 and then a subsequent fall in 2012/13. Cash purchases from traders and ADMAR/SFFRFM show an opposite pattern. Overall cash purchases from the private sector therefore appear roughly constant over the life of the FISP (although figure 5.7 does not provide any comparison with farmers' purchases before the FISP).

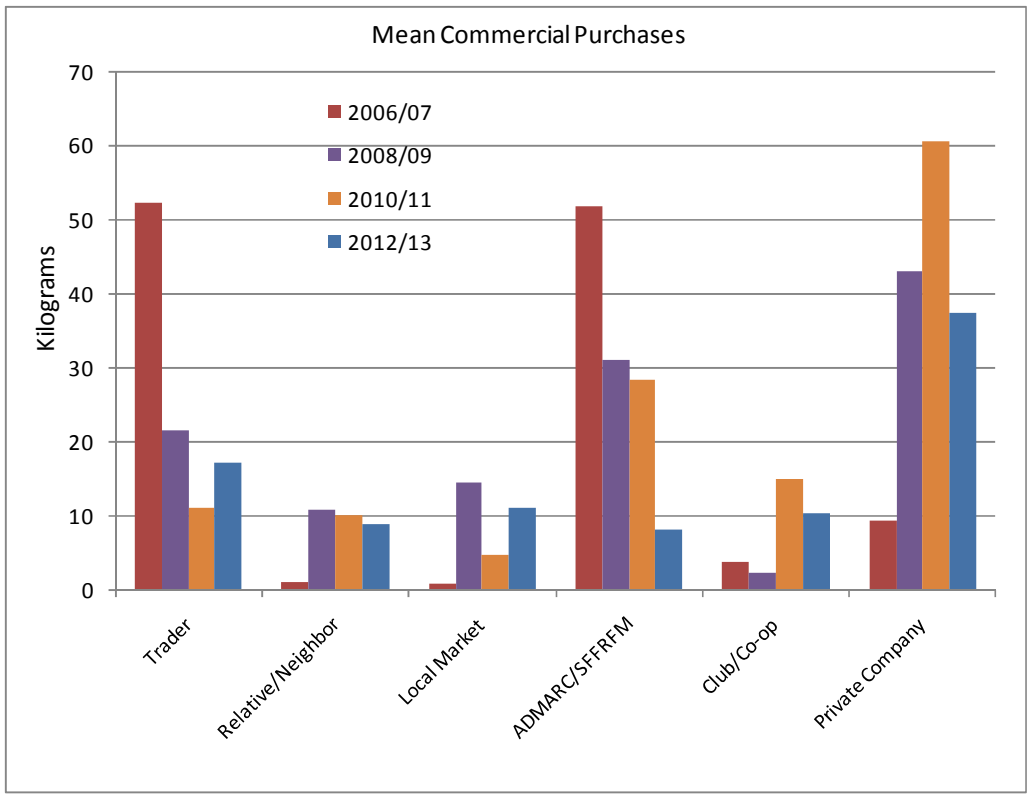

Figure 5.7 Mean Commercial Fertilizer Purchases by Farmers, 2006/07 - 2012/13

Source: Chirwa and Dorward (2013a,b); Household Survey 2012/13

6 Access to and use of coupons and inputs

In this section we report information from the household survey about households' access to, receipt and use of coupons and of subsidised inputs, and compare this information with information on coupon and input distribution as reported earlier in section 4.

6.1 Total coupon distribution

Total coupon disbursement and inputs sales as reported by the Logistics Unit were described earlier in section 4. We now compare these figures with estimates from the household survey. Figure 6.1 shows the key patterns of change in households' fertiliser coupon receipts from biennial surveys from 2006/7 while table 6.1 gives more detail on estimates of total coupon receipts from the 2012/13 household survey.

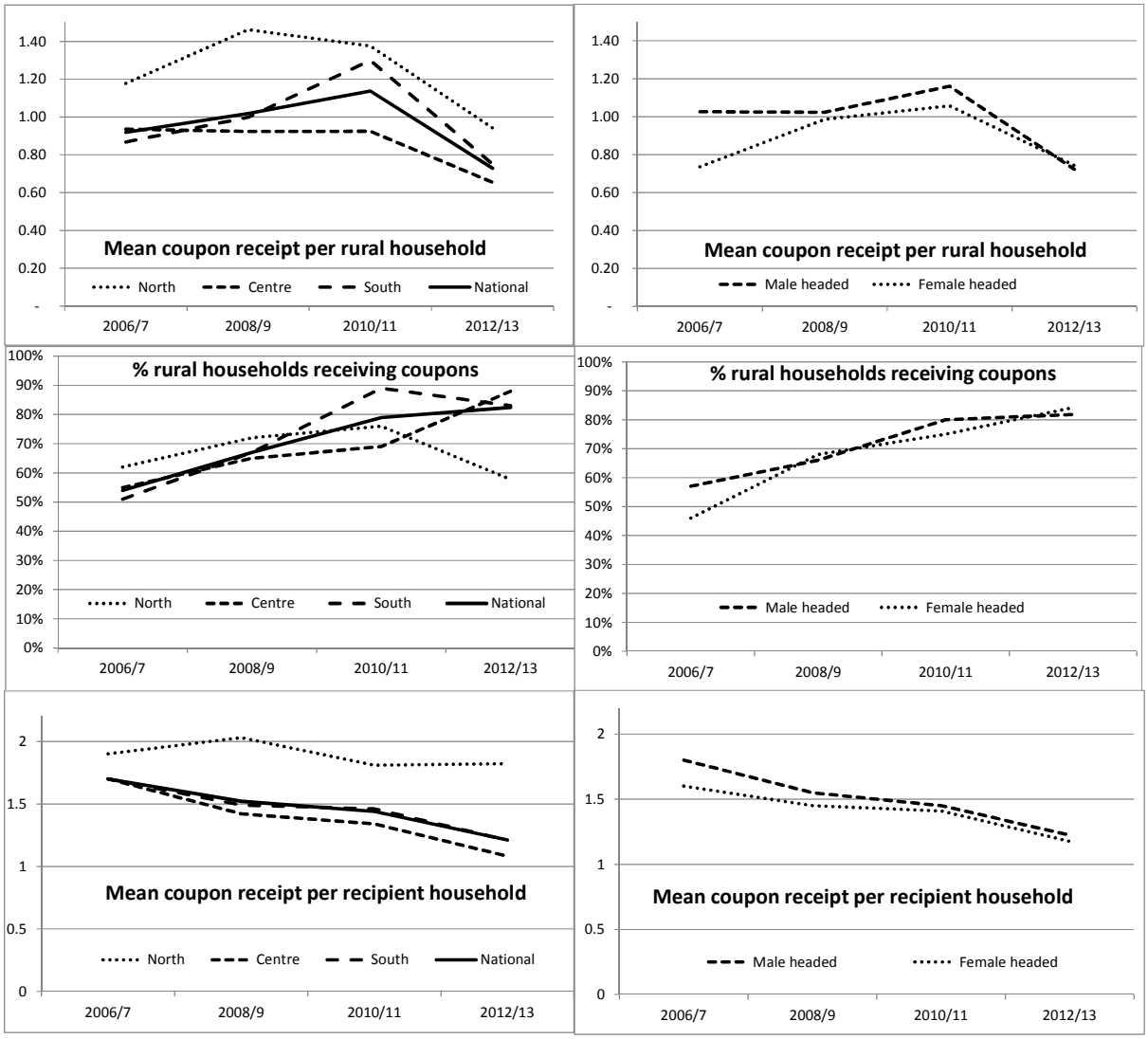

Figure 6.1 Household fertiliser coupon receipt, 2006/7 to 2012/13 (biennial surveys)

Note: 2006/7 and 2008/9 23:21:0 and Urea only

The top panel in figure 6.1 shows mean receipts per household and is comparable with figure 4.9 presented earlier and showing estimated total fertiliser coupon redemption per household. The two figures show a broadly similar rising and falling pattern (although comparison with estimates from the IHS3 (Dorward and Chirwa, 2013)suggests that the smaller sample in the 2010/11 survey may

have led to an overestimate of coupon receipts). The top panel also shows a declining differential between the north and the other two regions. In the second panel the increased proportion of households receiving coupons is due largely to an increase in the sharing of coupons between households, with a fall in the average coupons per recipient (in the bottom panel), associated with a shift in coupon allocations from the North to the South, with increased sharing in the centre and south but not in the North. The right hand panels (see data in table 6.2) show that a divergence between receipts by male and female headed households in 2006/7 appears to have been largely eliminated in subsequent years although there is a small but persistent discrepancy in coupon receipts per recipient household.

Table 6.1 Household survey estimates of total coupon receipts

	Fertiliser	Maize seed	Legume seed	Fertiliser coupons		
Average coupons received per hh				2010/11	2008/9	2006/7
North	0.94	0.46	0.42	1.38	1.46	1.21
Centre	0.65	0.29	0.15	0.92	0.93	0.96
South	0.75	0.48	0.37	1.29	1	0.84
Total	0.73	0.39	0.28	1.13	1.02	0.93
Total estimate of coupons received ('000), NSO rural households						
North	304	150	137	456	445	307
Centre	729	325	171	953	947	985
South	914	581	452	1,278	1,168	1,005
Total	1,936	1,044	744	2,733	2,540	2,296
Estimate as % redemptions/ sales, NSO hh						
North	77%	77%	82%	105%	73%	52%
Centre	58%	52%	29%	74%	72%	67%
South	65%	83%	68%	88%	71%	88%
Total	63%	68%	52%	86%	71%	72%
Total estimate of coupons received based on MoAFS farm households						
North	499	246	225	739	697	468
Centre	1,261	563	296	1,700	1,458	1,197
South	1,462	929	723	1,931	1,616	1,384
Total	3,212	1,732	1,235	4,420	3,734	3,043
Estimate as % redemptions/ sales, MoAFS ff						
North	126%	126%	134%	171%	114%	80%
Centre	99%	89%	49%	132%	111%	82%
South	103%	132%	109%	132%	98%	121%
Total	104%	113%	87%	139%	105%	95%

Sources: 2013household survey, MoAFS Farm Household Register, Census data (EA household populations), MVAC data.

Table 6.1 is presented in five panels. The top panel shows the coupons received per rural household estimated from the household survey. These estimates are then multiplied by the estimated number of rural households or farm families to calculate total coupons received by region and nationally[3]. A

[3] The survey sample enumeration areas in 14 districts, and MoAFS data show a slightly smaller proportion of farm families receiving coupons in these districts (as compared with the average across all districts) and this may result in under- estimates of coupon receipts by some 4%. IHS3 results in the 2008/9 and 2009/10 seasons also suggest that the estimates above may be increased by perhaps another 5% to allow for coupons going to households living in areas classified by the NSO as 'urban' and not rural.

difficulty arises as a result of substantial differences between the number of rural households recorded by the National Statistical Office and by the Ministry of Agriculture and Food Security. These differences (with MoAFS estimates 66% higher than those of the NSO) have been noted regularly in evaluation reports since the 2006/7 season, and there is an urgent need to resolve them – not only for the purpose of the evaluation of the FISP but as part of a wider need to improve the accuracy of agricultural and national information.

The NSO estimate of rural households suggests that a significant number of 2012/13 fertilizer and seed coupons did not reach the rural people for whom they were intended – some 30% (these estimates are comparable with estimates made using IHS3 data (Dorward and Chirwa, 2013)but a little higher than in 2006/7 and 2008/9 surveys). The Ministry of Agriculture and Food Security farm family figure leads to the estimated number of coupons received being a little larger than those issued. This discrepancy, together with unrealistic regional growth rates, anecdotal reports of households 'splitting' to register for coupons, and strong incentives for households to 'split' in order to increases eligibility for coupon receipt suggests that the MoAFS figures need to be interpreted carefully. NSO figures, the basis of the survey sampling frame, are also more compatible with survey estimates. Maize and legume seed coupon estimates show a broadly similarly pattern to that of fertiliser.

The right hand columns of the table show findings from previous survey rounds. The pattern of change is consistent with the combined effects of the fall in total fertiliser disbursement and rising population discussed earlier (see figure 4.9) - the very high figures in 2010/11 are not consistent with this and may be the result of a small and somewhat biased sample that year, despite attempts to make adjustments for expected bias.

6.2 Coupon targeting

Tables 6.2 and 6.3 provide some information about the distribution of coupons within the rural population. Table 6.2 shows the proportion of households receiving different numbers of fertiliser coupons, and the mean number of coupons received by those households receiving coupons, for different categorisations of households. A number of points of interest arise from this.

- 60% of households are estimated to have received one or more fertiliser coupons. As with all three previous surveys, community leaders consistently report a lower percentage of households as recipients, even after allowing for the potential effects of sharing on differences in perceptions of household recipients at village and household level.
- Many households (42%) are receiving only one coupon (or are sharing two coupons, with a half of the inputs each). As with survey results from previous years, this is less common in the North and more common in the South and Centre. There is also greater overall access in the south as compared with the centre (with a higher proportion of households receiving a higher average number of coupons per recipient household), a pattern in line with the MoAFS farm family estimates rather than the NSO rural household estimates.
- The major conclusion that can be drawn from table 6.2 is that significant proportions of households in all the categories identified in table 6.2 receive coupons. Sampling errors mean that too much should not be read into small differences between categories or years, nevertheless there do appear to be some consistent patterns of variation in receipt of coupons across categories: receipt seems to continue to be higher for households in the northern region (though this differences has been declining) and as noted above here is much less sharing; differences between proportions of male and female headed households receiving coupons seem to be low, but receipts per recipient household are consistently higher for male headed households. Elderly household heads appear to do somewhat better than other households, but much more striking, and a new and important observation, is the low access among younger households with heads aged between 18 and 24.

Table 6.2 Fertiliser Coupon receipts per household by region, gender & age of head, and food security &subjective welfare status

	2013 Sample size	2012/13					2010/11		2008/9		2006/7	
		Zero	>0 &<1	1	>1	Mean/ recipient	Zero	Mean/ recipient	Zero	Mean/ recipient	Zero	Mean/ recipient
North	360	48%	0%	9%	42%	1.82	24%	1.81	28%	2.03	38%	1.9
Centre	720	40%	17%	31%	12%	1.08	31%	1.34	35%	1.42	45%	1.7
South	921	38%	8%	37%	17%	1.21	11%	1.46	33%	1.49	49%	1.7
National	2001	40%	11%	31%	18%	1.21	21%	1.44	33%	1.52	46%	1.7
Male headed	1,454	41%	11%	30%	18%	1.22	20%	1.45	34%	1.55	43%	1.8
Female headed	530	37%	13%	35%	16%	1.18	25%	1.41	32%	1.45	54%	1.6
Youth head	208	60%	12%	23%	6%	0.93	na	na	na	na	N.A.	
Working age head	1,741	42%	11%	31%	16%	1.15	21%	1.43	35%	1.53		
Elderly head	260	27%	12%	34%	27%	1.29	21%	1.53	28%	1.49		
Maize for 0-3 months	163	42%	10%	29%	20%	1.26	40%	1.01	43%	1.32		
Maize for 4-7 months	367	41%	13%	35%	12%	1.10	21%	1.41	30%	1.4		
Maize for 8-10 months	576	36%	13%	36%	16%	1.14	25%	1.34	27%	1.6		
Maize for >10 months	284	33%	14%	29%	24%	1.30	17%	1.3	36%	1.77		
Poorest (Ovutikitsitsa)	535	41%	11%	33%	15%	1.15	29%	1.29	40%	1.31		
Ovutika	745	38%	12%	31%	19%	1.23	19%	1.42	30%	1.5		
Ovutikilako	426	37%	10%	33%	20%	1.25	21%	1.42	30%	1.56		
>=wapakatikati	224	46%	11%	28%	16%	1.22	17%	1.69	36%	1.8		

Notes: The 2010/11 season sample was considerably smaller and from a more restricted set of livelihood zones than the other season's samples.

The great majority of households receiving between 0 and 1 coupon received 0.5 coupons, and almost all households who reported receiving more than one coupon received 2.

Source: 2013 household survey

Some of these differences are explored further in table 6.3 which shows mean gender of household head, land ownership, asset ownership, food security and subjective welfare by number of coupons received per household. There is a general trend for means of variables associated with wealth to be fairly constant or rise among households receiving more coupons – a situation also observed in previous surveys (and across seasons there has been a consistent exception to this pattern with months for which the maize harvest lasts declining with increasing numbers of coupons received). An additional aspect of this also observed in the 2008/9 survey is that the largest differences are often found between households with 1 coupon and those with more than 1 coupon – there are some higher means among households with zero coupons. One may hypothesise from this that the redistribution of coupons which leads to households getting one coupon is from poorer households and/or to poorer households – and in the second aspect may be more effective in targeting poorer household than the formal distribution process. No consistent differences in allocation were found between livelihood zones or between areas with patrilineal and matrilineal systems (see table A5).

Overall these observations, which are consistent with a number of other studies (for example (Holden and Lunduka, 2012; Holden and Lunduka, 2010a) and preliminary analysis of the IHS3 (Tilic, Pers. comm) and (Dorward and Chirwa, 2013) suggest limited effectiveness of targeting poorer and more vulnerable households - they are not excluded but they are relatively under represented, while less poor households are not excluded and appear to be somewhat over represented among beneficiaries with more coupons[4]. This raises important questions about targeting and coupon

allocation and distribution processes. Since 2006/7, targeting criteria have placed more explicit emphasis on the provision of coupons to more vulnerable households – emphasising child or female headed households, people living with HIV/AIDS, vulnerable people and their guardians or carers, if they are resource poor Malawians and owning land. We note that there have been changes and improvements over the years, but it is not clear how far this may have been driven by improved local targeting and how far by the relative shift of allocations from the north and centre to the south where there are more poor people and where the practise of sharing seems to increase the proportion of poor people accessing small quantities of subsidised inputs. More analysis is needed on this. We do, however, give considerable attention later, in section 6.3, to the processes of beneficiary selection and coupon distribution and redemption.

Table 6.3 Mean Attributes of Households by number of Fertilizer subsidy coupons received per household, 2012/13

	Fertiliser Coupon numbers per hh				
	Zero	>0 &<1	1	More than 1	All
Sample size	789	222	621	348	1,980
% households female headed	24	30	29	24	0.26
Owned Area in ha	0.90	0.88	0.94	1.16	0.96
Value durable assets (MK)	34,401	23,242	25,804	55,189	34,052
Value Livestock assets (MK)	53,110	26,824	45,697	179,997	69,787
Total Value livestock & durable assets (MK)	87,511	50,066	71,501	235,185	103,840
Subjective score of hh food consumption over past 12 months	1.4	1.4	1.5	1.6	1.5
Subjective score on welfare	2.2	2.2	2.2	2.3	2.2
Month after harvest that maize ran out	6.9	7.3	7.2	7.5	7.2

Subjective scores on food consumption: 1 = less than adequate, 3 = more than adequate
Subjective scores on welfare: 1 = Ovutikitsitsa/ukavu; 6= rich, Opezabwinokwambiri/Olemera
Source: 2013 household survey

In recent years beneficiary registration has also distinguished between male and female beneficiaries. As noted earlier (see table 4.3), females accounted for 54% of registered beneficiaries nationally. Table 6.4 shows the gender of recipients and of beneficiary household heads as reported in the household survey.

Table 6.4 Planned and actual fertiliser coupon receipt by household head & recipient gender by region

Region	Beneficiary list , % beneficiaries		Actual hh head , % beneficiaries		Actual recipient , % coupons	
	Male	Female	Male	Female	Male	Female
North	33%	57%	76%	24%	71%	29%
Centre	40%	59%	75%	25%	59%	41%
South	50%	48%	69%	31%	47%	53%
TOTAL	44%	54%	72%	28%	54%	46%

Source: 2013 household survey

Table 6.4 shows a similar pattern to that reported for 2010/11, with receipts by females lowest in the North and highest in the South (the reverse of the pattern of registered beneficiaries as set out

in the left hand column and earlier in table 4.3). However, it also shows that there are substantial numbers of male headed households where women (not the male head) receive the coupons.

The outcomes reported above can also be compared with people's perceptions of which kinds of people are most likely to receive coupons. Table 6.5 presents answers to questions where respondents were asked to score the extent to which particular types of household were more or less likely to gain coupons. With mean scores for most categories of people clustering around 2 (i.e. no difference in likelihood of getting coupons) the results show no clear perceptions of particular target or beneficiary groups except that there is a general understanding that civil servants and teachers are less likely to obtain coupons, and to a lesser extent and only in the Northern region that better off households and more productive farmers are also less likely to likely to obtain coupons. No strong differences were observed between the perceptions of people in different areas but there is a slightly greater tendency for respondents in the North to suggest that likelihoods of getting coupons follow targeting guidelines (with poor and female headed and those with orphans being more likely to get coupons and more advantaged people having a smaller chance of getting coupons. Some households mentioned other categories of households as more or less likely to get coupons: elderly households were reported as being both more and less likely to get coupons, in the South and Centre traditional leaders and their relatives were mentioned as more likely to get coupons, and in the South those who mentioned the disabled generally considered them less likely to get coupons.

The lack of evidence of clear targeting contrasts with clear perceptions of FISP target groups reported in the community survey and FGDs, who generally considered poorer and female headed households, those with orphans and the elderly to be intended beneficiaries although perceptions of actual beneficiaries reported in FGDs were more varied.

Table 6.5 Perceived likelihood of getting coupons

	Region			Total
	North	Central	South	
Poor people	1.67	1.98	2.03	1.96
Female headed households	1.84	2.12	2.09	2.07
More productive farmers	2.28	2.08	2.05	2.09
Households with orphans	1.75	2.12	2.04	2.04
Better off households	2.33	2.14	2.06	2.12
Civil servants & teachers	2.62	2.58	2.35	2.49
VDC members	2.01	1.82	1.71	1.79

Scores: 1 = more likely; 2= no difference; 3 = less likely
Source: 2013 household survey

A common theme in FGD discussions on targeting was that the FISP has now become an annual programme, and the same people are targeted year after year, unless there are deaths or people move away. This would explain the large numbers of young households who do not get coupons, as reported from household survey data above. Some focus group discussions also expressed considerable distrust of local extension agents (sometimes in league with village heads) and in many groups there was more trust in local leaders to ensure that coupons went to the members of their villages instead of being siphoned off for sale. This seems to contradict earlier experience of problems when coupons were allocated and distributed by village heads, particularly in the Central Region. There was widespread support for more involvement of villagers themselves to have more influence in decision making about coupon allocations and for the links between coupon allocation and distribution to be more transparent.

6.3 Allocation and distribution processes

An important innovation in 2008/9 was the introduction of 'open meetings' during the registration and distribution process, with two objectives:

a) To ensure that FISP beneficiaries (and non-beneficiaries) are adequately informed about the operation of the FISP and have realistic expectations; and
b) To include households in the targeting process, removing targeting power from TAs and village heads and giving it to the community itself.

A further innovation in 2012/13 was the introduction of publicly available lists of beneficiaries.

Tables 6.6 to 6.8 report on respondents' perceptions of these processes. First, table 6.6 shows the extent to which open meetings were used in the allocation and distribution of fertiliser coupons, and the extent of subsequent redistribution and supplementary allocations. The pattern of reported use of open meetings is very similar to that reported in 2008/9, with widespread use of these meetings, particularly in the north. Table 6.6 also shows that subsequent redistribution is common in the south and centre, but less common in the north(this tallies with reporting in the previous sections of regional variation in the extent of 'sharing' and receipt of one fertiliser coupon). Supplementary allocations were common in the early years of the programme but largely ceased after the 2008/9 programme. The same question was asked in the community survey with similar responses as regards the widespread use of open meetings for coupon allocation and distribution and substantial subsequent redistribution of fertiliser coupons.

Table 6.6. Frequency of coupon allocation and distribution methods by coupon type

	Open meetings in		Redistr-ibution	Suppl-ementary
	allocation	distribution		
North	96%	98%	38%	1%
Centre	65%	78%	61%	2%
South	70%	77%	66%	17%
Total	71%	80%	61%	9%

Source: 2013 household survey

However it appears that the use of open meetings is not necessarily related to wider participation in allocation and distribution decisions. In the 2010/11 survey VDC members (particularly in the north) and local leaders (Village heads and TAs) were generally reported to be important in allocation and distribution in open meetings. In 2012/13 respondents were asked specifically who decided on the allocation of fertiliser coupons, and the answers, in table 6.7, show the overwhelming perception that Village heads and TAs predominate, while very few respondents considered that villagers had much influence through open meetings. Agricultural staff members were also not perceived to be of much importance in the allocation process, although in previous years they were considered to be more important in the distribution of coupons. Almost no respondents reported specific influence by political leaders.

Table 6.7 Decision makers regarding coupon allocations

	Village head/TA	VDC	Agric. Staff	Villagers in open meeting	Political leaders
North	67%	21%	0%	6%	0%
Centre	78%	9%	4%	4%	0%
South	70%	7%	4%	5%	0%
Total	73%	10%	3%	5%	0%

Source: 2013 household survey

Respondents in FGDs recognised that traditional leaders and VDC members were predominant in making coupon allocations decisions, but mention was also made of agricultural staff and there were reports of decisions being made in prior meetings and of bias in invitations to meetings where allocations were made.

Table 6.8 reports by region on the percentage of respondents who were aware of the existence of public beneficiary lists and on perceptions and knowledge about lists which were public. The majority of respondents considered that there was a list of beneficiaries, but in the north very few thought that the list had ever been publically available. Overall around 30% of respondents were aware of publically available lists. Of those that were publically available, the majority were available at the house of the village head and were available from October or November. About 10% of respondents reported that the list had been seen by a member of their household (2% in the north), and most of these had seen the name of a household member on the list. (FUM (Farmers Union of Malawi), 2013) which reports 51% of *beneficiaries* reporting that they had seen the list. The community survey reported a somewhat higher proportion of lists being publicly available (around 50% in the Centre and South, but only 20% in the North), mainly in November, with schools and health clinics the most common locations for public access. This greater awareness of public beneficiary lists, and of their role in promoting accountability, was also evident in some FGDs, as evidenced in the quotations below:

"People were listed on a piece of paper and this paper was available to everyone for inspection since it was posted at the village head's house."

"There was a list written by the VDC members. This list was publicly available. When the names are written, they are called at a meeting. The VDC members keep this list and people are allowed to see it. This list was published in September, and some of the ladies taking part in the FGD's saw this list. This list served as evidence that the right person who is supposed to receive the coupons managed to get them". Female FGD - Blantyre

There was, however, considerable variation between FGDs. Thus in Blantyre while the women's FGD in one area indicated that the list was readily available for everyone's inspection (as reported above), the male group alleged that the VDC kept the list and that no one else had access to it.

Table 6.8 Reported respondent awareness of public beneficiary lists

		North	Centre	South	Total
Respondents reporting a list		95%	72%	77%	77%
% of reported lists publically available		7%	42%	45%	39%
% of available lists by place published	Village head house	71%	65%	61%	63%
	School/Health Centre	0%	28%	21%	24%
	Agric. Office	12%	0%	3%	2%
	ADMARC/Input Market	9%	3%	9%	6%
% of available lists by month published	October or before	37%	46%	51%	48%
	November	44%	40%	42%	41%
	December	10%	13%	4%	8%
	January	9%	1%	2%	2%
% of available lists seen by a household member		31%	36%	32%	34%
% of seen lists with a household member Included?		86%	81%	82%	82%

Source: 2013 household survey

As regards the value of the list in specifying who actually received fertiliser coupons, table 6.9 shows that of those respondents who had seen the list, the majority (57%) considered that 'nearly all' those on the list would receive coupons for some fertiliser, but only 16% considered that 'nearly all' households on the beneficiary list would receive coupons for two bags of fertiliser. However 40% of

respondents who had seen the list considered that very few households on the list would get coupons for two bags of fertiliser, and 21% did not know how many would get coupons for two bags. For households not on the list, 38% of respondents did not know how many of these households would get fertiliser coupons, while 27% thought that some of them would get coupons for some fertiliser. These responses appear to reflect the significant amount of 'sharing' of coupon allocations in the South and Centre (there were very few respondents in the North who had seen a beneficiary list) together with considerable uncertainty as to how the list related to actual coupon receipt. Respondents in the community survey appeared to have a clearer view that all or nearly all of those on the list received at least one coupon and, in the south and centre, that some (rather than very few) of those not on the list received at least one coupon. There are, however, questions about the validity of the list when there is widespread 'sharing' of coupons with beneficiaries not on the list.

Table 6.9 Respondent perceptions on coupon receipt by listed and unlisted households among households that saw the list

		Proportion of households receiving coupons			
		nearly all	some	very few	don't know
Listed households	coupons for some fertiliser	57%	14%	24%	5%
	coupons for two or more bags	16%	22%	40%	21%
Unlisted hh	coupons for some fertiliser	7%	27%	28%	38%

Source: 2013 household survey

6.4 Perceptions on total coupons, systems over time and alternative targeting systems

As the number of coupons distributed and formal allocation and distribution systems have changed over the life of the programme, and as the programme has become established, it is useful to consider how respondents' perceptions of the systems have changed. Figure 6.2 shows changes in respondents' perceptions of different aspects of programme implementation and their views of alternative targeting criteria.

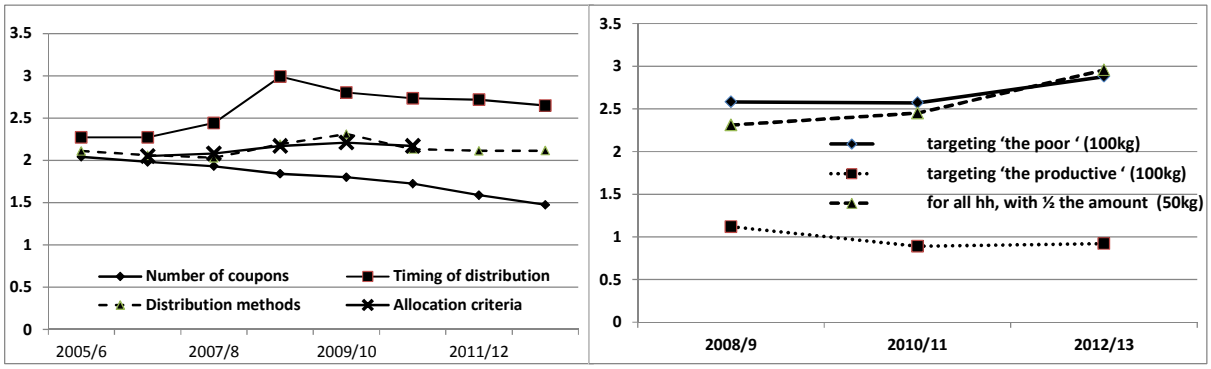

Figure 6.2 Respondents' scoring on different programme elements by year

Scores: 4 = very good; 3= good; 2 = not good not bad; 1 = bad; 0 = very bad

Source: 2013 household survey

The left hand panel of figure 6.2 shows that respondents recognised an improvement in timing of coupon and input availability from 2006/7 to 2008/9, but since then it has slowly fallen off though still averages between "good" and "not good not bad". This matches information presented earlier in section 4.1 on fertiliser procurement and distribution and in section 4.3 on coupon distribution. There is then little change in perception on distribution methods or allocation criteria (although information was not gathered on the latter in 2012/13), which is compatible with observations in section 6.2 and 6.3 that there has been little change in the effectiveness or processes of targeting and coupon allocation despite the introduction of open meetings and public beneficiary lists designed to improve them. FGDs, however, expressed a generally more positive view of the process

in 2012/13 (although there were some exceptions). There is, however, a clear downward trend in the scoring on the number of coupons distributed. In recent years (though not in earlier ones) this matches the data presented earlier on both fertiliser distribution and fertiliser coupon receipt, reflecting a decline in total fertiliser sales since 2007/8 and rising rural population. There was widespread concern expressed in FGDs that the number of people was increasing but the number of coupons was remaining the same, and that access to coupons was therefore declining,

As regards respondents' perceptions of different targeting criteria and systems, it is clear that the majority do not favour targeting more productive farmers to the exclusion of other. The other two systems they were asked to comment on are 'targeting the poor' (more effectively than at present and with two fertiliser coupons, 100kg of fertiliser per beneficiary) and a universal system with half the amount to all households (a system which would extend the current 'sharing' to all households, to the detriment of those generally better off households getting two coupons and bags, and the benefit of mainly poorer households currently getting none). There are similar scorings for these two alternatives (both of them better than scores achieved for the current distribution system), with some evidence that the latter is gaining in favour. The impression that maintaining or increasing the number of coupons is more important than maintaining the quantity per recipient also seemed to be gaining ground in the FGDs, though there was still dislike of formalising a system where people only got two 25kg bags (and there appeared to be some regional differences here, with a greater tendency in the central region to favour raising of the redemption price or the introduction of a general price subsidy). These options and their relative strengths and weaknesses are discussed in some detail in Dorward and Chirwa (2012c). In particular it is not clear how better targeting of the poor can be achieved.

6.5 Access to coupons and timing

Due to its sensitivity, information on purchases of coupons is unlikely to be reliable. Around 1% of fertiliser coupons were reported as being obtained with some payment (lower than reported in previous surveys). Reported sources of such coupons included TAs and Village heads, agricultural staff, and traders in approximately equal proportions. Reported prices varied dramatically, with means of around MK2,000 for fertiliser coupons but lower medians (of 1000 and 600 MK/coupon respectively for 23:21:0 and Urea coupons) and a mean of a little over MK1300 and a median of MK1000 for maize seed coupons. In the community survey highest prices for fertiliser coupons were reported at MK1000 in the North, MK3000 in the South, between MK5000 and MK8000 in the Centre and around MK1000 for maize seed coupons.

An important aspect of access to coupons is the timing of their distribution. As reported earlier, timing of coupon distribution was considered to have improved over the life of the programme but was delayed somewhat this year. Specific information on the time of coupon receipt was collected from survey respondents and in the community survey. Community survey respondents reported a large proportion of communities receiving the first distribution of coupons in the first and second halves of November in the North and South, and in the second half of November and first half of December in the Centre. FGDs provided similar information, with concern expressed about late delivery of 23:21:0. In the household survey 88% and 75% of fertiliser coupons were reported to be received by the end of November in the South and Centre respectively, and 100% by the end of December in the North. These timings are later than in 2010/11 in the South and Centre but still considerably earlier than reported in previous surveys (equivalent figures were99% and 83% and 98% in 2010/11, 69%, 65% and 68% in 2008/9 and 54%, 49% and 45% in 2006/7).

6.6 Coupon use and redemption

The vast majority (95%) of fertiliser coupons are reportedly used to buy fertilisers. The balance was, sold (2% in the Centre) or not used (7% in the Centre and 3% in the South, 4% overall). Respondents also used a very high proportion of maize seed coupons to buy seed (98%), the balance being largely

'not used'. For legume seed coupons, however, 94% were used to buy inputs (considerably higher than 81% in 2010/11), the balance being largely unused (17% in the North 5% in the Centre and 4% in the South)[5].

The dominant reason given for not using the coupon to buy inputs was lack of stock at selling points (71% for fertilisers, 36% for maize seed and 76% for legume seed) but the importance of this varied between coupons (as the proportion of coupons not redeemed varied between coupon types and regions, as noted above). Thus for fertiliser coupons, 3.5% of all coupons were not used because of lack of inputs at stockists, and equivalent figures for maize seed and legume seed were 1% and 5%. There was virtually no difference between male and female beneficiaries' use of coupons for buying inputs. In some FGDs it was reported that some beneficiaries did not use coupons because of late availability of coupons or inputs.

Teasing out the proportion of coupons not used for different reasons, there was small tendency for female beneficiaries to more often report lack of money as a reason for not redeeming inputs (this accounted for 13%, 0% and 7% respectively of maize seed, legume seed and fertiliser coupons received by female beneficiaries against 0%, 0% and 2% of maize seed, legume seed and fertiliser coupons respectively received by male beneficiaries). It is, however, difficult to separate how far this may be due to gender differences and how far it may be due to regional differences in poverty incidence given that the proportion of coupons received by female beneficiaries was much higher in the south, where poverty incidence is highest.

FGDs reported very few cases of coupon purchases and sales. Community survey respondents reported that selling of coupons was generally rare. Recent analysis by Holden and Lunduka (2013) of farmers' valuation of fertilisers also suggests that coupon sales are very rare.

Coupon redemption is affected by costs of redemption (in terms of input prices, side payments, time spent waiting and travelling, and other travelling costs) and by the ability and willingness of beneficiaries to incur those costs.

In the household survey, 9% of fertiliser coupons were reported to require payment of 'tips' for redemption above the official 500MK redemption price (this compares with 9%, 14% and 20% reported in 2010/11, 2008/9 and 2006/7 respectively). Reported extra payments ranged from 30MK to over 4,500MK, with a median of MK1,050 (a total cost of just over 1,500MK for redemption and 'tip'). The incidence of extra payments was lower in the North It is difficult to determine extra payments made for hybrid seed, as extra payments were required for some hybrid varieties. Mean payment was MK111 per coupon, and was similar for male and female beneficiaries. Payments per hybrid seed coupon were lowest in the Centre and highest in the South. It is difficult to interpret these comparisons without detailed calculations on the proportion of different varieties purchased.

Community survey respondents suggested a greater occurrence of the need for farmers to pay 'tips' in the Centre, with their 'often' being required in nearly 50% of communities in the Centre, and in 30% of communities in the North, but in only 10% in the South. Overall a median tip of MK1500 per bag was reported. Focus group discussions suggested that the payment of bribes to redeem inputs was less common this year. Where it occurred it was however related to problems of queuing and to some paying 'tips' to get to the front of the queue. There were also occasional reports of beneficiaries being required to take seed types they did not want if they were to buy an input in scarce supply.

Table 6.9 presents summary data on reported distances to buy inputs, time spent buying inputs, and costs for transport and miscellaneous expenses. Community survey results are similar. As with previous surveys, this does not show major differences between regions. The greater distances to

[5] As will be explored later, use of a coupon to buy inputs does not mean that the inputs are necessarily used for crop production by the beneficiary.

markets and larger differences in distances to ADMARC and private selling points tend to be in less populous areas and are thus masked in aggregation at national and regional levels. Distances to actually redeem coupons were greater where inputs were not stocked in the nearest outlet. Distances to the nearest private sector outlet were somewhat greater than distances to ADMARC/SFFRFM, except in the northern region. The lower time travelling and waiting for inputs in the North may be because of fewer stock outs (see table 6.10) and less queuing (consistent with lower payment of tips), so that lower waiting times outweighed any greater distances – although table 13 does not show longer distances in the north this is indicated as something of an issue in table 6.16. This was also reported in previous surveys. FGDs in almost all areas also reported well organised systems of different days for different villages to receive their inputs at markets – however it was also noted that if there were stockouts then this could severe disruption to the system and lead to beneficiaries being unable to get inputs from other outlets. Adverse effects could be particularly severe for vulnerable people who sent representatives to collect their inputs as these representatives faced difficulties in having the coupons validated outside of the system.

Table 6.9 Reported distances to buy inputs, time spent buying inputs, and costs for transport and miscellaneous expenses.

		Hours travel & waiting		Transport & misc. expenses		Distance to nearest ADMARC/SFFRFM (km)		Distance to nearest private selling point (km)	
		Mean	Median	Mean	Median	Mean	Median	Mean	Median
2012/13	North	7	6	530	500	6	5	6	5
	Centre	17	10	568	300	6	5	8	7
	South	10	7	394	200	6	5	8	5
	Male	13	8	527	300	6	5	8	6
	Female	11	7	378	200	6	5	8	6
	Total	13	8	486	260	6	5	8	6
National: 2010/11		23	12	270	200	5	4	8	6
2008/9: National		17	9	304	200	9	5	14	8
2006/7: National		13	7	247	150	7	5	7	5

Source: 2013 household survey

Almost all redeemed coupons were used to obtain the input specified by the coupon, although there were occasional reports of fertiliser coupons being used to obtain seed and vice versa, and of urea coupons being used to obtain 23:21. There were no reports of 'cross redemption' between maize and legume seed coupons. Table 6.10 shows the shares of maize and legume varieties obtained in each region and by male and female beneficiaries – showing a pattern of heavy hybrid maize seed sales and low legume seed sales consistent with that reported earlier under implementation and in supplier survey.

As regards the balance between hybrid and OPV seed sales there is little variation between male and female beneficiaries purchases reported (unlike the preponderance of hybrid seed purchases by female beneficiaries in 2010/11) and between regions (again there was more variation reported in 2010/11, with more hybrid seed purchases in the Centre and South). Reasons for the discrepancy between survey estimates and Logistics Unit sales reports on maize variety seed sales are not clear, but Logistics Unit reports also show consistency in the balance of variety sales across regions – but considerable variation between districts, with Chikwawa and Nsanje reporting very low hybrid sales as compared with OPV, and a similar but not as extreme nor universal tendency among lakeshore and other lower lying districts. Similar but much less pronounced variation between districts and zones is found in survey estimates.

Table 6.10 Seed redemption variety shares, % total maize and legume seed redemptions

	Beneficiary		Region			Total	% sales reported
	Male	Female	North	Centre	South		
Maize seed redemptions							
Hybrid	89%	85%	84%	84%	90%	87%	78%
OPV	11%	15%	16%	16%	10%	13%	22%
Legume seed redemptions							
Soya	19%	10%	35%	26%	6%	15%	8%
G/Nuts	60%	71%	45%	47%	76%	65%	65%
Beans	18%	15%	20%	26%	13%	17%	23%
Cowpeas	1%	1%	0%	2%	1%	1%	1%
Pigeon pea	2%	2%	0%	0%	4%	2%	2%

Source: 2013 household survey; 2012/13 Logistics unit Report

The estimated balance between legume seed types' sales is very consistent with sales reported by the Logistics Unit. The Logistics Unit does not report legume seed redemptions by district, but survey estimates show wide variation between districts in the balance among different legumes purchased. Pigeon pea purchases are, as one might expect, only found in the South. Other variation may be due to variation between regions in preferences and/or availability of different seed types. Beneficiary preferences for inputs are discussed later, but It appears that the lower soya seed purchases in the south are the result of preferences, as hardly any beneficiaries in the south indicated that they did not get but would have wanted soya: in fact in the South although only a small proportion of legume seed beneficiaries got soya (6%), a substantial proportion (29%) of these wanted other legume seed: groundnuts (18%), beans (6%) or pigeon peas (5%). In the Centre 26% of legume seed beneficiaries got soya seed and all wanted it while in the North 35% of legume seed beneficiaries got soya and of these 13% would rather have had groundnuts. In all regions most beneficiaries who wanted groundnuts got them. Despite the low proportion of cowpea seed purchases there appears to be very little unsatisfied demand. As noted above, there were some beneficiaries in the South who would rather have had pigeon peas than soya seed. There were also others who would rather have had groundnuts than pigeon peas

The large majority of cases where beneficiaries could not get what they wanted were due to unavailability of the desired seed type. Community survey respondents reported on the frequency of stock-outs for different inputs, and these are summarised in table 6.11. The reported overall situation is better than reported in 2010/11 as regards fertilisers and generally a little worse for seeds (except for groundnuts seed where there as a marked improvement)..

Table 6.11. Mean scores on frequency of stock outs by input by region

	Fertiliser		Seed				
	23:21	Urea	Hybrid	OPV	Beans	Gnuts	Soya
North	1.76	1.58	1.56	1.38	3.00	1.61	1.68
Centre	1.83	1.67	1.49	1.58	1.59	1.41	1.33
South	1.71	1.59	1.46	1.18	1.41	1.53	1.35
All 2012/13	1.77	1.63	1.49	1.37	1.52	1.48	1.38
All 2010/11	2.19	1.85	1.16	1.19	1.54	1.68	1.34
All 2008/9	1.84	1.66	1.23	1.71	2.52	2.32	NA

Mean scores: 1 mostly available; 2 some stock outs; 3 frequent stockouts
Source: Community survey

Focus group discussions also noted shortages, fertiliser being specifically mentioned.

Table 6.12 shows how far inputs redeemed by beneficiaries were the inputs that they wanted. This does not include information from those who did not redeem particular coupons. On the whole beneficiaries got the fertilisers they wanted (99% overall). Of those who got hybrid seed, 87% got the hybrid variety they wanted, 10% wanted a different hybrid variety, while hardly any wanted OPVs. However, only 72% of those who got OPV seed wanted it, almost all wanting hybrid seed instead. This pattern of maize seed supply and preferences was common across all three regions and across male and female beneficiaries. As regards legume seed, almost all of the beneficiaries who got groundnuts seed got it from choice, even though it accounted for 65% of reported legume seed redemptions (as noted earlier) – indeed in the South and to a lesser extent the North there were some beneficiaries who received soya seed (and to a lesser extent pigeon peas and beans seed) who would have preferred groundnut seed.

Some FGD groups reported varied experience as regards getting the inputs that they wanted, with some commenting that if they were already late or becoming late with planting then they had to take whatever was available.

Table 6.12 Beneficiaries' receipt of preferred seed varieties

	Wanted	Input wanted but not available						
Input received		23:21:0	Urea	Hybrid	OPV	Soya	G/Nuts	Beans
23:21:0+S	98%		2%					
Urea	100%							
Hybrid seed	87%			10%*	1%			
OPV seed	72%			27%				
Soya seed	88%						9%	2%
G/Nuts seed	97%					1%	2%*	
Beans seed	91%					1%	2%	6%*
Pigeon pea	77%						13%	9%

Notes: * indicates that beneficiaries wanted a different variety to that supplied
To improve clarity of presentation all zero cell entries have been removed and are left blank. Almost all cells are zero for cowpeas and pigeon peas, so these columns are omitted.
Source: 2013 household survey

Table 6.13 compares the maize varieties farmers reported that they had received, and those that they prefer. There are difficulties with the different names used by farmers to describe varieties, but clearly there is some correspondence between these, with two hybrid varieties consistently in the top two rankings.

Except in the north, a much lower proportion of outlets were reported in the community survey to suffer from frequent major queues (and much lower than in 2008/9 and 2006/7). An important point about queues is that their impact is greatest on poor people, as for some the additional payments to overcome the queues and limited time available made it impossible to redeem coupons. FGDs suggested that in some cases the use of beneficiary lists exacerbated redemption difficulties as they reduced the ease with which beneficiaries could redeem inputs from other markets when the markets they were registered at had no inputs.

Table 6.13 Top 5 Maize variety redemption purchases and preferences, % households

			Rankings by different household types					
Bought	All	% Total share	Poor Hh	Male Hh heads	Female Hh heads	North	Centre	South
SC 403 (KANYANI)	1	40%	1	1	1	1	1	1
SC 627 (MKANGO)	2	17%	2	2	2	3	2	2
DKC 8053	3	5%	3	3	8	4	6	3
DK	4	3%	6	4		9	3	
ZM 623	5	3%	4	6	3	10	7	4
ZM 521	15	1%			10	8		8
Preferred								
SC 403 (KANYANI)	1	51%	1	1	1	1	1	1
SC 627 (MKANGO)	2	12%	2	2	2	2	2	2
DKC 8053	3	5%	3	3	3	6	4	3
MH 18	4	3%	5	4	5	10		4
ZM 623	5	2%	6	7	10	4		6

Source: 2013 household survey

We now consider how households who received coupons found the cash needed to redeem them. Table 6.14 summarises reports by recipients of coupons in the household survey, though problems of fungibility often make it difficult to identify precisely how particular cash expenditures are financed. The table shows that most households used general savings, and ganyu was also important. Investigation of differences by household characteristics shows variation in the relative importance of different sources, with female headed households relying a little more on gifts, and falling dependence on savings and rising reliance on gifts and ganyu for more food insecure and lower welfare households. This is similar to information reported for 2008/9. An apparent trend of increasing reliance on ganyu over the last six years could be explained by rising real wage rates or increasing poverty, or a changing combination of the two over time. Very few respondents report use of income from public works programmes.

Focus group discussions reported similar ways in which people accessed cash to redeem their coupons – with ganyu reportedly more common among men and poorer people, and selling of assets more common among women.

Table 6.14 Primary sources of cash for input purchase by region, gender of head, and subjective welfare & food security status (% coupon recipient households)

	savings	loan	gift	PWP	ganyu	other
North	85%	0%	4%	0%	10%	0%
Centre	72%	3%	3%	0%	18%	3%
South	49%	2%	6%	1%	27%	15%
National	63%	2%	5%	0%	22%	9%
Female headed	55%	1%	13%	0%	18%	12%
Male headed	66%	2%	2%	0%	23%	7%
Poorest (Ovutikitsitsa)	57%	3%	5%	0%	28%	7%
Ovutika	61%	2%	6%	1%	23%	8%
Ovutikilako	67%	1%	3%	0%	16%	14%
>=Wapakatikati	77%	1%	3%	1%	12%	6%
Maize for 0-3 months	46%	1%	12%	0%	37%	5%
Maize for 4-6 months	55%	3%	4%	0%	31%	6%
Maize for 7-9 months	59%	2%	5%	0%	23%	10%
Maize for >9 months	74%	2%	3%	2%	12%	7%
Total 2010/11	72%	1%	4%	0%	15%	8%
Total 2008/9	77%	2%	4%	1%	11%	5%

Source: 2013 household survey

Finally, we examine problems that beneficiaries may face when redeeming coupons at markets, and their perceptions of the roles of different stakeholders or players at markets. Table 6.15 shows the proportion of respondents reporting problems experienced and considered serious by market and coupon type, whereas able 6.16 shows the same but only for fertiliser redemption and by region. In both tables the list of problems is arranged in order of declining importance of problems identified with fertiliser redemption in all markets. The tables suggest that:

- As expected there are considerably more problems with fertiliser coupon redemption than with seed redemption (and some of the problems with seed redemption at parastatal markets are likely to be associated with the simultaneous sales of fertilisers and with the problems and pressures that causes);
- Long queues are considered a problem by almost 50% of respondents who redeemed their fertiliser coupons at either ADMARC or SFFRFM, with the incidence lowest in the South and more serious in the North and Centre (as also reported in the community survey);
- Many of the problems are inter-related – for example input shortages are likely to lead to long queues and these then increase the need for facilities at the markets and the opportunities and tendencies for poor and/or corrupt services, and they may also lead to beneficiaries having to go to other markets, where appropriate lists and systems for protecting the vulnerable are not in place;
- The Central Region shows a markedly higher level of complaints and concern about problems – as noted these may be inter-related, but this appears to be an issue that needs particular attention (a greater perceived incidence of problems of stockouts in the Centre was also reported in the Community Survey) ;

- For maize seed sales the problems seem to be more prevalent with parastatals than with retail chains and agrodealers, but the parastatal problems may be associated with the pressures and challenges of fertiliser redemption, and the private sector outlets are not immune from reported problem;
- All the problems listed are serious – the two with lowest frequency of reporting are extremely serious when they occur, and may have been under-reported where beneficiaries are female but the survey respondent is male - although there are very limited discrepancies between the incidence of gender related problems (gender violence, sexual demands, and separate toilets) between responses by male and female households (in fact for all three issues a higher incidence was reported by male headed households than by female headed households).

Table 6.15 % respondents identifying serious problems during coupon redemption at market outlets by coupon and market type

	Fertiliser vouchers		Maize seed		
	ADMARC	SFFRM	Parastatal	Chain	Agrodealer
Long queues	47%	47%	31%	16%	7%
Queue jumping	37%	42%	24%	10%	5%
Long distance	35%	25%	32%	18%	12%
Vendors	33%	25%	22%	4%	2%
Input shortages	32%	27%	17%	4%	10%
Slow service	28%	30%	13%	3%	3%
Scrambling/fighting	26%	13%	19%	6%	2%
Late /early hours	24%	20%	12%	7%	2%
Demands for 'tips'	22%	8%	9%	10%	2%
Rude staff	20%	12%	9%	3%	1%
No toilets	18%	23%	15%	3%	6%
No drinking water	18%	21%	16%	7%	6%
No M/F toilets	16%	24%	15%	0%	5%
Abusive language	11%	3%	3%	6%	1%
Gender violence	8%	0%	2%	3%	0%
Sexual demands	3%	1%	1%	6%	0%
Average	23%	20%	15%	7%	4%

Source: 2013 household survey

FGDs shared similar concerns about coupon redemption, and considered coupon redemption to be more problematic than coupon receipt. Two sets of people appeared to stand out as the most helpful: market committees and the village heads. On the other hand, market clerks and vendors were singled out as trouble makers in some markets, not all. In a male FGD in Dedza, participants indicated that clerks were very slow, especially if they knew that there were vendors or politicians around that wanted to get the commodities illegally. In Lilongwe the problem with vendors was said to be high, jumping queues with no respect. In Dedza it was also reported that vendors connived with clerks to buy the fertilizer and later resell it for K14,000.00. In Phalombe vendors were described as '*rude and tough*". FGDs in Ntcheu, Kasungu, Mangochi reported late opening and early closing of the ADMARC markets as one of the challenges in redeeming coupons.

Table 6.16 % respondents identifying serious problems during fertiliser coupon redemption at market outlets by region

	North	Centre	South	All
Long queues	51%	66%	29%	47%
Queue jumping	29%	57%	19%	37%
Long distance	41%	40%	28%	34%
Vendors	16%	55%	16%	33%
Input shortages	23%	44%	21%	31%
Slow service	7%	45%	16%	28%
Scrambling/fighting	14%	41%	13%	25%
Late /early hours	9%	40%	11%	23%
Demands for 'tips'	4%	38%	9%	21%
Rude staff	5%	36%	7%	19%
No toilets	8%	26%	14%	18%
No drinking water	14%	24%	13%	18%
No M/F toilets	4%	24%	12%	17%
Abusive language	6%	20%	3%	10%
Gender violence	0%	15%	2%	7%
Sexual demands	0%	5%	1%	3%
Average	14%	36%	13%	23%

Source: 2013 household survey

Respondents' perceptions of the roles of different stakeholders for redemption of fertiliser coupons are presented by region in table 6.17 and by market outlets in table 6.18. Consistent with the discussion of serious problems above, vendors are more prevalent and more problematic in the Central Region and in ADMARC. In general there is generally a greater perception of stakeholders' presence at markets in the Central Region. The high reports of market clerks as 'not normally present' does, however, pose questions about respondents' understanding of the question.

Table 6.17 % respondents by perceptions of presence and role of stakeholders in fertiliser coupon redemption by region

	Not normally present				Normally present & helpful				Normally present & problem			
	North	Centre	South	All	North	Centre	South	All	North	Centre	South	All
Vendors	80%	33%	81%	60%	7%	1%	1%	2%	7%	54%	11%	29%
Police	55%	38%	45%	43%	42%	50%	52%	50%	1%	3%	0%	2%
VDC members	29%	24%	30%	27%	67%	63%	59%	62%	2%	6%	1%	3%
Market committee	83%	55%	63%	62%	16%	29%	27%	27%	1%	8%	0%	3%
Village head	26%	17%	7%	13%	73%	70%	82%	76%	0%	4%	1%	2%
Market Clerk	76%	46%	54%	53%	19%	37%	36%	35%	3%	11%	0%	5%
Other Market officials	94%	55%	72%	67%	6%	25%	19%	21%	0%	11%	0%	5%
Politician	95%	89%	89%	90%	3%	4%	6%	5%	0%	2%	1%	1%
Agricultural Officials	64%	62%	52%	57%	34%	17%	37%	28%	1%	3%	0%	2%

Note: The frequency of 'normally present and inactive' (the balance) is not shown.
Source: 2013 household survey

Table 6.18 % respondents by perceptions of presence and role of stakeholders in fertiliser coupon redemption by market outlet

	ADMARC			SFFRFM		
	Not normally present	Normally present		Not normally present	Normally present	
		Helpful	Problem		Helpful	Problem
Vendors	59%	2%	29%	75%	0%	21%
Police	43%	50%	2%	48%	49%	0%
VDC members	27%	61%	3%	29%	57%	1%
Market committee	57%	24%	3%	50%	34%	0%
Village head	13%	75%	2%	12%	81%	0%
Market Clerk	49%	32%	5%	48%	33%	0%
Other Market officials	60%	19%	5%	62%	18%	0%
Politician	85%	5%	1%	90%	6%	0%
Agricultural Officials	57%	28%	2%	58%	28%	1%

Note: The frequency of 'normally present and inactive' (the balance) is not shown.
Source: 2013 household survey

6.7 Input purchases and use

Of the inputs obtained with coupons, the majority were reported as used on the respondents' plots. This applied to almost all fertilisers and hybrid maize seed. Figures were slightly lower for OPV and legume seed (see table 6.19) with some being kept over for the following year and some legume seed being eaten. Sales are probably under reported. FGDs also reported almost universal use of coupons to buy inputs for use on people's fields. Isolated incidences of coupon sales were reported in Kasungu, Nkhotakota and Mangochi FDGs due to lack of inputs to buy and some sales by 'poor people'.

Table 6.19 Subsidised input use by type of input redeemed

	Fertiliser	Maize seed		Legume seed				
		Hybrid	OPV	Soya	G/Nuts	Beans	Cowpeas	Pigeon pea
Own garden	97%	96%	89%	89%	89%	83%	100%	92%
Shared with others	2%	1%	2%	1%	1%	1%	0%	0%
Sold	1%	0%	0%	0%	0%	1%	0%	0%
Kept for next crop	0%	2%	9%	4%	2%	1%	0%	0%
Other (eaten)	0%	0%	0%	4%	3%	3%	0%	0%

Table 6.20 shows use of fertilisers and maize seed by crop and variety. This is of interest as it shows that the majority of the subsidised fertiliser was reportedly used on hybrid maize, with none used on burley tobacco. The application of hybrid seed to composite/OPV maize seed plots suggests that there may be some mixing of seed (also suggested by information on reported cropping patterns) but perhaps also some difficulties in clearly separating between OPV and hybrid varieties.

Table 6.20 Subsidised fertiliser and maize seed use by crop

Crop	Fertiliser	Hybrid maize seed	OPV maize seeds
Local maize	29%	45%	63%
Composite/OPV maize	9%	23%	37%
Hybrid maize	62%	32%	0%
Burley tobacco	0%	0%	0%

Source: 2013 household survey

6.8 Technical advice

Proper use of subsidised seed and fertiliser is an important determinant of the impact of the FISP. Table 6.21 compares reported receipt of advice from field assistants by survey respondents categorised in different ways. The percentage of respondents reporting receipt of advice in the 2012/13 season (11%) is a little lower than reported in 2010/11 and 2008/9 (13%), figures which were again lower than in 2006/2007 (22%). Since greater access to extension advice should enable people to use their inputs more efficiently, to greater benefit for all, increasing the coverage of extension advice to subsidy recipients should be given more attention. The need for and benefits of this are reinforced by the generally good scoring of advice by those who do receive it. Mean scores of the usefulness of advice are generally good (and similar to 2010/11 and 2008/9 which were higher than in 2006/2007).

There is important variation in receipt of advice by different types of household, with female headed and lower welfare households receiving less advice. Differences in perceptions of the quality of advice are mixed. There is weak evidence of recipients of coupons appearing to receive a little more advice than non-beneficiaries.

Table 6.21 Receipt and quality of technical advice from Field Assistants by coupon recipient by region, gender & age of head, and subjective welfare & food security status

	All households				Fertiliser coupon recipients			
	New varieties		Fertilisers		New varieties		Fertilisers	
	% hh with advice	Scoring of advice	% hh with advice	Scoring of advice	% hh with advice	Scoring of advice	% hh with advice	Scoring of advice
North	17%	3.2	14%	3.4	23%	3.3	19%	3.3
Centre	8%	3.0	8%	3.1	9%	3.2	11%	3.2
South	11%	3.6	11%	3.6	12%	3.6	11%	3.7
National	11%	3.3	10%	3.4	12%	3.4	12%	3.5
Female headed	9%	3.4	8%	3.4	10%	3.5	9%	3.4
Male headed	11%	3.3	11%	3.4	13%	3.4	13%	3.5
Poorest (Ovutikitsitsa)	8%	3.2	7%	3.3	10%	3.3	9%	3.4
Ovutika	9%	3.5	9%	3.6	11%	3.7	10%	3.7
Ovutikilako	15%	3.3	13%	3.5	14%	3.3	15%	3.4
>=wapakatikati	13%	3.1	13%	3.2	17%	3.1	18%	3.1
Maize for 0-3 months	8%	3.7	11%	3.3	16%	3.8	14%	3.8
Maize for 4-6 months	7%	3.3	5%	3.3	9%	3.2	5%	3.2
Maize for 7-9 months	13%	3.4	12%	3.5	12%	3.9	13%	3.8
Maize for >10 months	9%	3.5	8%	3.7	9%	3.5	9%	3.7
National 20010/11	14%	3.3	14%	3.3	15%	3.4	15%	3.3
National 2008/9	14%	3.2	14%	3.3	17%	3.3	17%	3.3

Scores: 1= useless; 2= not very useful; 3= average; 4=useful.
Source: 2013 household survey

6.9 Input preferences

Specific attention was given in FGDs to asking if respondents had any preferences for other inputs apart from maize and legume seed and 23:21:0 and urea for maize. The vast majority of groups were satisfied with the types of input provided although there were requests for more legume seed (especially groundnut seed and to a lesser extent soya and bean seed). In a small number of groups there were requests for rice (in Karonga), tobacco and cotton inputs (in Ntcheu) and for vegetable seeds. There were no specific requests for other inputs by FGDs in Chikwawa.

6.10 Implementation conclusions

This section of the report has presented a review of information on households' access to and use of coupons and subsidised inputs in 2012/13. The main points to note are:

- Overall estimates of fertiliser receipt are a little under 70% of MoAFS distribution reports if the NSO rural household population is used or over 100% if MoAFS farm family numbers are used to multiply average receipt of 0.73 coupons per household. This discrepancy is a major issue for the implementation and evaluation of the FISP, and indeed for national statistics, and its resolution should be a matter of urgent prioritisation.
- As indicated by MoAFS targets and distribution figures, over the life of the FISP there has been a shift in allocations from north to south, and this is associated with increasing sharing or splitting of coupons and coupon packs, with many beneficiaries only receiving one rather than two fertiliser coupons.
- As reported in previous surveys and other studies, beneficiary targeting does not seem to particularly favour the poor or the better off, though there is some bias to the latter. Differentials between different types of household may arise as regards the likelihood of receiving any coupons and the number of coupons received. Thus for example female headed and male headed households have roughly equal chances of subsidy receipt, but female headed beneficiaries receive on average fewer coupons. Such differentials appear to reflect different groups' initial identification as beneficiaries and then, if a beneficiary, on their ability to hold onto their allocation rather than share it, or, if a non-beneficiary, their ability to benefit from sharing of others' coupons. A new finding is the relative under-representation of youth headed households among beneficiaries, with lower coupons received per beneficiary. As in 2010/11, female beneficiaries are well represented within male headed households in the south, but are poorly represented in the centre and, particularly in the north. Further attention needs to be given to major improvements made in targeting objectives and systems – for example can information about certain household characteristics that could be used in targeting be collected recorded at registration and subsequently used in targeting?
- As in 201/11, open meetings are widely used in allocating and distributing coupons, however new analysis suggests that such meetings are primarily concerned with the announcement of already decided allocations rather than actual collective and participative allocation of coupons.
- Implementation of the initiative to make beneficiary lists public has been patchy, with publication reported by some 30% of respondents. In these cases it appears that there was limited understanding of the potential role of such lists in promoting accountability.
- New information is presented on stock outs, demands for tips, and other problems faced by beneficiaries when redeeming their coupons for inputs, and it appears that reports of problems are generally much higher in the central region. This raises questions about possible underlying causes for the apparent discrepancies between regions. Is this due to different standards and expectations among respondents, to differences in management by agricultural or ADMARC staff, or to differences in social relations, norms and behaviour among village leaders, for example? We may then ask if and how good practice and norms can be better shared within and across regions – it is clear from the innovations introduced over time in the programme that this does already happen (with, for example, in some areas the involvement of accountable local committees in sensitisation, beneficiary registration and coupon distribution; the establishment of distribution centre liaison committees; the scheduling of particular days for input sales to different villages (widely introduced in 2012/13); and separate queues for men and women waiting to redeem coupons).
- The majority of beneficiaries obtained the inputs that they wanted, and despite shortages of different types of legume seed this also applied to legume seed, where the majority of

respondents appeared to demand and get groundnuts, with regional variations in the demand for soya seed and pigeon peas.

- The vast majority of coupons are reported to be used on beneficiaries own crops.
- Finally, as regards extension advice, a relatively low proportion (11 to 12%) of both beneficiaries and non-beneficiaries report the receipt Extension advice on maize seed varieties and fertiliser use, but there is generally good appreciation of the quality of extension advice received.

7 Direct impacts

7.1 Incremental production

The major pathway by which the FISP generates benefits is through increased production of maize and legumes as a result of increased use of subsidised certified seeds and inorganic fertiliser inputs. Previous sections have considered the distribution of these inputs. We therefore begin our examination of direct impacts of the programme by considering the productivity of these inputs. Previous work in evaluations and in other studies have faced a number of difficulties in analysing maize crop yield data from surveys (Dorward and Chirwa, 2010b; School of Oriental and African Studies et al., 2008). This has suffered from inconsistent results and problems of data quality and of multi-collinearity between different crop management variables (such as variety, fertiliser use, plant density, weeding, and time of planting). Information from research station trials, on the other hand, generally fails to adequately represent returns under smallholder conditions. The limited supply of legume seed in the early years of the programme has also meant that little attention has been paid to legume yields and the productivity of legume seed – and there are even greater difficulties in determining legume yields and productivity as a result of widespread intercropping of legumes.

Four new approaches were pursued as regards improving estimates of agronomic returns to incremental maize seed and fertiliser use as a result of FISP:

- Information was sought from nationwide on-farm trials conducted under ASWAP
- Yield responses were estimated from crop production data collected under the IHS3
- An attempt was made to gather new data using crop cutting methods on yield sub plots in farmers' fields administered by resident enumerators in two areas in Lilongwe and Zomba
- Crop simulation modelling was commissioned to investigate the potential for this approach in estimating likely yield responses under smallholder conditions and crop management regimes

Data on yields were also gathered for some legumes using crop cutting methods. In this section we briefly summarise the main findings from each of the approaches listed above.

7.1.1 On Farm trial Maize yield data

A report and data were kindly supplied by Dr W Makumba of Chitedze Research Station regarding nationwide on-farm baby and mother trials investigating maize yields with different rates of inorganic fertiliser and legume inter-crops. (Makumba et al., 2012) reports Nutrient Utilisation Efficiency (NUE) for nitrogen on hybrid maize plots ranging from 13.2 to 21.7 kg yield per kg nutrient on farmer try-out trials in different districts in 2010/11.On average 16.8 kg yield per kg nutrient was realised with relatively high rates of fertiliser use (around 90 kg/ha N and 250 kg of fertiliser per ha). NUE should be higher for the lower rates of fertiliser application reported by farmers using subsidised fertiliser in the 2013 household survey (around 20kg/ha N or 60kg fertiliser per ha for those only applying subsidised fertiliser and 40kg/ha N or 120 kg/ha fertiliser for those applying both subsidised and unsubsidised fertiliser). Attempts to estimate NUE using raw data from 2011/12 farmer try-outs[6]faced problems of multi-collinearity between nitrogen application rates and plant density is a possible explanation for unreasonably high NUE estimates obtained.

7.1.2 Analysis of IHS3 maize yield data

The IHS3 data set (obtained from http://go.worldbank.org/6A7GUDQ1Q0) was used to compile a file containing reported yields and a range of potential yield determinants from 12,586 IHS3 plots.

[6] We are grateful to Dr W Makumba for making this data available.

Variables on per ha yield and input use were constructed using the GPS area estimates. Variables included yield per ha, nitrogen and phosphate application per ha, variety (local or hybrid, with very small numbers of OPV and recycled hybrid reported), planting date, seed rate, time of fertiliser application, farmer judgement of soil quality (good, fair or poor), pre-harvest labour use per ha, region, pure or mixed stand, and number of years land left fallow. Records were cleaned with outlier observations set to 'missing'. Various quadratic and interaction variables were constructed and regressions were estimated to determine the influence of these variables on yield, with specific interest in the response to nitrogen and phosphate fertiliser application. Regression coefficients provided very low estimates of Nutrient Use Efficiency and yield responses to N, P and fertiliser[7], varying from -1.2 to 3 kg yield per kg fertiliser (23:21 and Urea). These very low yield responses were inconsistent across different model estimates (using different data subsets) and are also inconsistent with farmer beliefs about the efficacy of fertiliser use (expressed by both their desire for subsidised fertiliser and by the willingness of many farmer to invest scarce resources in purchases of unsubsidised fertiliser) and with large numbers of on farm research trials (for example Makumba et al. (2012) cited above, sources cited in School of Oriental and African Studies et al. (2008) and Kamanga et al. (2013). These inconsistencies raise serious doubts about the estimation of yield responses using data that relies on farmer estimates and reports of fertiliser application and production.

Dorward and Chirwa (2010b) discuss these concerns with specific reference to yield estimation in the AISP/FISP evaluation surveys conducted in 2006/7 and 2008/9 and to nitrogen response rates calculated from these surveys. Specific issues were raised regarding both production and area estimates and reporting by farmers.

Difficulties with farmer estimates of area are resolved in the IHS3 by the use of accurate GPS measurements of plot areas, and in the 2012/13 FISS4 surveys farmers' plot area estimates were augmented by GPS measurements for one randomly selected plot per household. Investigation of the relationship between GPS measurement and farmers' estimates of plot areas showed that individual plot (and hence aggregate household) areas estimated by farmers were marginally greater than GPS measured areas (by 5% and 8% respectively in the IHS3 and FISS4 surveys)). This over-estimation bias is however more pronounced for larger plots, whereas farmers' estimates for smaller plots tend to be less biased, and indeed may be greater than GPS measures for smaller plots. This is shown in figure 7.1.

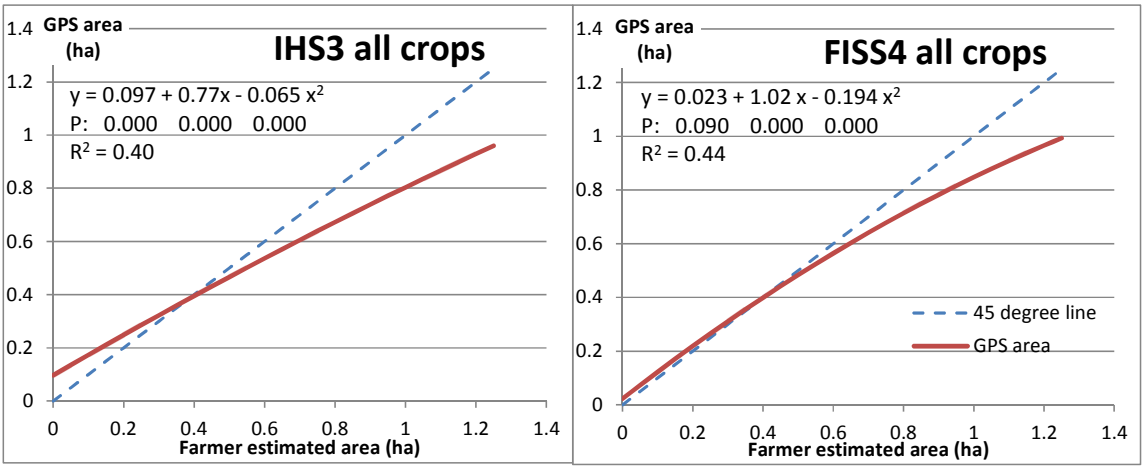

Figure 7.1 Farmer estimates and GPS measurements of plot areas in the IHS23 and FISS4 surveys

[7] The draft report presented in September 2013 reported higher but very variable estimates of these responses, but unfortunately in preparing the final report an error was discovered in the analysis and correction of this had major effects on the results.

Farmer estimates also tend to be clustered into half or whole number acre measures.

The precise effects of biased farmer estimates of plot area on estimates of yield and fertiliser yield response estimates need further investigation, and are relevant to interpretation of analytical results from surveys relying on farmer estimates of areas. These issues are not, however, relevant where survey data allow analysis using GPS measures of plot areas. However the presence of both sampling error and bias in farmer estimates of plot areas must also raise questions about the presence of sampling error and bias in farmer estimates of crop production and fertiliser use. These issues appear to have received little attention in consideration of yield and fertiliser yield response estimates in Malawi.

With regard to plot production estimates, a seminal study that led to a continent-wide shift from reliance on crop cutting to reliance on farmer estimates reported that in surveys conducted in five different African countries farmer estimates of plots' production of staple crops were more reliable than crop cut estimates from yield sub plots but this 'depends critically upon the accuracy and consistency of the conversion factors connecting the variety of traditional volumetric units used to standard units of weight' (page 9, Verma et al. (1988). This condition does not appear to hold in Malawi. In the IHS3 data on plot maize production around 16% of plots have production reported in oxcarts (largely in the central region, which accounted for over 80%of plots with production reported in oxcarts), 70% of plots have production reported in 50kg bags, and 6% have production reported in kilograms, with 8% reported in other units. Over the sample as a whole around 80% of plots have yield reported in shelled maize, and shelling conversions provided in the dataset have identical shelling conversion factors for kilograms (a weight measure) and for oxcarts and 50kg bags (volume measures). Mean (unweighted) yield estimates differed widely between plots according to reported units, in ways that could not be explained by, for example, rates of fertiliser application[8]. These observations suggest that there is no standard and reliable measure of maize production used in Malawi, and not only are conversion measures likely to be unreliable, farmers' basic estimates of the most commonly reported unit (shelled maize in 50kg bags) are also likely to be unreliable and may well suffer from bias[9].

Furthermore, while Verma et al. (1988) report that *on average* farmer estimates give reliable production measures, they do not appear to report any investigation of how there may be different biases above and below the mean (as found above with farmer estimates of plot areas). Such differential biases may not matter when estimating aggregate production and (with unbiased area measures) average yields, but they may have substantial impacts on yield response estimates. Here, for example, a tendency for farmers to over-estimate low production and under-estimate high production would lead to an under-estimate of crop yield responses to, for example, fertiliser. Such differential bias in farmer estimates is highly plausible[10].

[8] Yield from plots with production reported in oxcarts, 50 kg bags and kilograms were 2,006, 1,297, and 712 kg/ha respectively, while reported nitrogen application rates were 45, 55, and 45 kg N/ha respectively.

[9] Dorward and Chirwa (2010b) for example note possible bias from farmers wishing to over or under report production (to attract resources or to impress) and farmers may face difficulties in estimating plot production if some is harvested green, if harvesting is in stages, and if maize is stored on thecob. They also note that farmers who tend to sell maize may under-estimate weights while farmers who tend to buy maize may over-estimate weights if traders do not use standard measures when buying and selling grain, while farmers that neithersell nor buy maize may lack experience with measurements.

[10] Some evidence for this is provided by visual inspection of a scatter plot on page 19 of Verma et al. (1988)- although the scatterplot is included to demonstrate the wide variance between farmers' production estimates and actual production for individual plots– and by discussion of results from Zimbabwe on page 24.

Biases may also be expected in the reporting of fertiliser use. Here some farmers who have received subsidised fertilisers but then sold it to others may report use of that fertiliser on their land if they are unwilling to disclose fertiliser sales (a plausible situation given threats that sales of subsidised fertiliser will be punished in some way). Similarly farmers who buy subsidised fertiliser from other farmers may be unwilling to report its use. In the first case a plot reported as having received fertiliser will not have had it applied, while in the second case a plot reported as having no fertiliser will actually have received it. Both these situations will lead to a downward bias in estimated yield response to fertiliser application.

Taken together, these concerns and the low yield responses from surveys relying on farmer production estimates as compared with on farm trial data and farmers' willingness to invest in fertiliser (Holden and Lunduka, 2013) need to be taken seriously. They suggest that acceptance and use of low yield response estimates from household surveys need to demonstrate that these estimates are not subject to the effects of the potential downward biases discussed above. We are not aware of proper consideration of these issues in studies reporting these estimates.

This discussion extends and provides a stark demonstration of the concerns raised by Dorward and Chirwa (2010b) about attempts to use survey data to estimate NUE. Dorward and Chirwa (2010b) raise a further concern that we do not consider here, the way that multi-collinearity in such data may render their estimates inherently biased. We therefore look for other data sources to estimate smallholder NUE, and this leads us to crop simulation modelling, which we discuss in section 7.1.4.

7.1.3 Resident enumerator survey maize yield estimates

A survey of 150 households in Zomba and Lilongwe districts was conducted from November 2012 to 2013. Data was collected on labour use and employment, and on crop husbandry and yields. Information on wage rates is used in section 8, here we briefly present in table 7.1 principle results on maize, groundnut and beans yields.

Maize grain yields, harvested in $50m^2$ yield sub plots, ranged from 286-6,233 kg/ha with a mean of 2,803±1,184 kg/ha. Yields of local maize are higher than the expected on-farm yields of 2,000 or 1,000 kg/ha for fertilized or non-fertilized local maize, respectively. Local maize here includes recycled seed of improved varieties such as OPV. Plant populations recorded in yield sub plots ranged from 18,600 to 84,000 maize plants/ha and this may contribute to variability in maize yield responses to inorganic fertilisers[11]. For sole cropped maize, the recommended planting pattern of 75cm x 75cm x 3 seeds (ridge spacing x within row spacing x No. of seeds per station) or 75cm x25cm x1 seed gives a population of 53,000 plants/ha. Groundnuts and bean yield are also estimated, though with smaller sample sizes. Beans were in all plots grown as an intercrop with maize.

Table 7.1.Crops grown and yields, 2012/2013 growing season, Lilongwe

Crop	Variety	No. of plots	Yield (kg/ha)			Plant Population/ha		
			Mean	Min	Max	Mean	Min	Max
Maize	Hybrid	94	2,803	2,86	6,233	4,1447	19,600	84,400
	Local/Rec'd*	46	2,394	599	3,648	46,438	24,000	74,200
	OPV	10	3,036	1,761	4,678	3,9600	28,000	63,800
	All maize	153	2,787	286	6,233	4,2987	18,600	84,000
Beans		46	384	69	993	-	-	-
Groundnut		13	922	220	2,023	50,938	38,600	80,000

*Local includes recycled OPV maize, hybrid includes some recycled hybrid

[11] Regression analysis did not provide significant and consistent estimates. Verma et al. (1988) report large over estimates of plot yields from $25m^2$ yield sub plots when compared with whole plot harvesting.

7.1.4 Crop simulation modelling

Professor Anthony Whitbread and colleagues at the University of Goettingen were commissioned to undertake a review of information on maize yield fertiliser responses in Malawi and to develop a simulation model of yield responses under smallholder farm conditions and crop management regimes. The review confirmed earlier observations (School of Oriental and African Studies et al., 2008)that there was very limited published information about yield responses under smallholder conditions, and that with the information that is available it is very difficult to separate fertiliser yield responses from confounding effects of different varieties, weeding regimes and planting densities. The review also confirmed the importance of these management practices as determinants of yield response, and these interactions were then investigated with subsequent crop simulation modelling.

Full results from this modelling are presented in the report of this work (Whitbread et al., 2013). Overall the simulations appear to have provided very useful information. Key findings presented include the importance of weeding, adequate phosphorous and good plant populations for higher nitrogen responses; the interactions between weeding, plant population and rainfall; differences between and benefits of hybrid and local varieties under different conditions. These interactions are illustrated by four graphs taken from Whitbread et al. (2013) and reproduced in figure 7.2.

These graphs show that with a particular phosphorous deficient soil type

- both hybrid and local varieties have very low returns to higher rates of inorganic N fertiliser application unless phosphate is added
- hybrid nevertheless consistently provides higher yields than local, even with low nutrients and 'poor' management
- good weeding leads to consistently higher yields
- high and moderate plant populations (defined as 30,000 and 50,000 plants per ha) gave higher yields than low plant populations (defined as 15,000 plants per ha) with higher rates of N applications, but low and moderate plant populations gave higher yields with lower rates of N application
- consequently there are low returns to higher rates of nitrogen at low plant populations

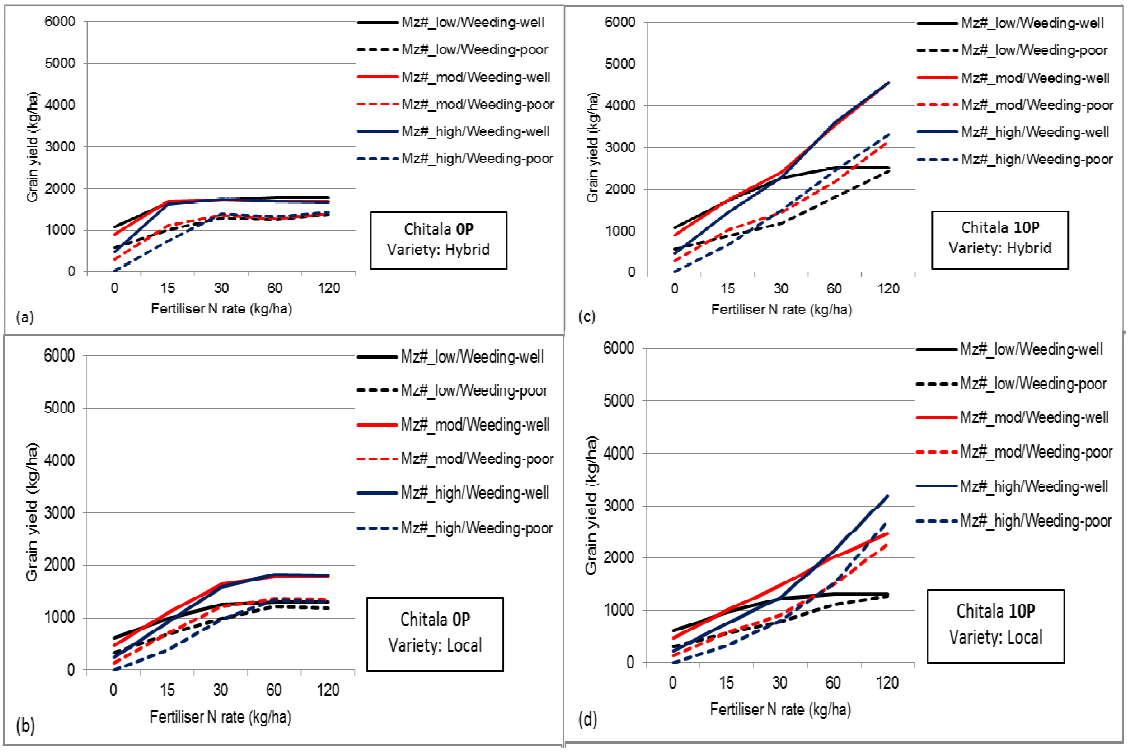

Figure 7.2 Hybrid and Local Maize Yield responses to Nitrogen under different phosphate, plant density and weeding conditions (from Whitbread et al. (2013)

Not shown in the graphs is the effect of planting time, with delays of a month from 1st of December to 1st of January leading to substantial percentage reductions in yield (of 20 to more than 50%).

The implications of these results for yields and fertiliser and variety responses under smallholder management conditions are explored here by applying them to patterns of smallholder maize management observed in the 2012/13FISP household survey. This was achieved by first using the set of simulation results (with over 44,000 observations from all soil, treatment and rainfall combinations) to estimate a statistical model linking crop management to yield[12] and then applying coefficients from this model with mean crop management variables from the 20012/13survey to estimate average yields and yield responses achieved by smallholders in Malawi. The results are presented in table 7.2, which shows average crop management parameters observed in 2012/13 for maize plots where fertiliser reported as subsidy fertiliser was applied together with predicted average yields and crop management yield responses for these plots.

[12] Full details of this model are available from Andrew Dorward, lead author of this report. A polynomial was found to perform better than a log-linear or Cobb Douglas production function, giving an R^2 of 0.773 and all 57 variables (including multiple interactions) were significant at P=0.001 except Phosphate*weeding and Rainfall*soil depth. Collinearity was only found between two variables which one would expect to be negatively related, planting date and 'in crop rainfall', with P=0.001.

Table 7.2 Estimated yields and yield responses with 2012/13 smallholder maize management

		Maize plots with subsidised fertiliser			
	Variety	***Local***	***Hybrid***		
	Management	*a. Mean*	*b. Mean*	*c. As (a)*	*d. Mean but high plant pop.*
Means					
N applied	(kg/ha)	33.2	39.6	33.2	39.6
P applied	(kg/ha)	8.3	11.4	8.3	11.4
Plant population	('000 plants/ha)	20.1	13.9	20.1	27.7
In crop rain	(mm)	590	590	590	590
Planting time	(months from Dec 1st)	0.08	0.14	0.08	0.14
Variety	(local 0, hybrid 1)	0	1	1	1
Weeding	(poor 0, good 1)	0.66	0.74	0.66	0.74
Soil Depth	(shallow 0 deep 1)	0.5	0.5	0.5	0.5
Fertiliser timing	(months from planting)	0.91	0.80	0.91	0.80
Soil Phosphorous	(kg/ha)	0.75	0.75	0.75	0.75
Model estimates					
Maize yield	(kg/ha)	1,392	1,921	1,955	2,293
Average yield response					
NUE N (kg grain/kg N)	Mean conditions	18	23	26	29
	Phosphorus deficient	10	15	19	21
	Weeding = 0.5	18	24	26	30
	15,000 plants/ha	16	24	24	24
	In crop rain 500mm	16	22	24	28
	Planted mid Dec	18	24	27	30
NUE P_2O_5 (kg grain /kg P_2O_5)	Mean conditions	3	0	1	3
	Phosphorus deficient	29	31	23	29
Plant population	(kg/10,000 plants/ha)	332	438	363	346
Weeding	(kg/poor to good)	524	505	524	567
	% yield gain	60%	36%	37%	33%
Planting time	(kg/1 month delay)	-115	-44	-53	-59
	% yield loss	-8%	-2%	-3%	-3%
Fertiliser timing	(kg/1 month delay)	37	69	58	69
Variety	(kg local to hybrid)	na	570	562	635

Notes: 'Plant population' estimated from reported seed rate (kg/ha) with 1,080 plants per kg seed; 'In crop rain' uses average in crop rainfall recorded in simulations for 1928-2004;' Weeding' quality represented by % plots with two or more weedings; 'Soil depth' dummy set at 0.5; 'Fertiliser timing' represented as time of first fertiliser application in months after planting although this does not exactly describe the variable constructed for the modelling of the simulation results; 'Soil Phosphorous' set at 0.75 to represent possible proportion of soils affected by phosphorous deficit.

The top part of table 7.2 shows the means for the management variables in different sets of plots that received subsidised fertiliser: local maize plots *(a)*, and three sets of hybrid plots: first one representing average reported management *(b),* then one considering the effects of hybrid adoption

replacing local maize for plots where all other management variables are unchanged *(c)*, and finally, since the recorded mean plant population for hybrid appears to be very low, the final column *(d)* uses average hybrid management variables except for plant population where a higher plant population is introduced. Columns (c) and (d) therefore allow examination of isolated effects of hybrid maize adoption and increased plant population.

The lower part of the table then shows estimated average yield and yield responses under the different management regimes represented in the top part of the table.

The results show the following;

- NUE(N) , yield responses to N of 18 and 23 kg maize per kg N are estimated under mean management and conditions for local and hybrid maize respectively (see columns (c) and (d)).
- with other variables held constant, responses to N may be higher with higher plant populations or lower where Phosphate is limiting. They also fall with higher rates of Nitrogen application, but appear to be relatively unaffected by weeding quality and planting date (though overall yields are affected by weeding quality and planting date).
- yields are not very responsive to phosphate application unless soil phosphate levels are low, in which case yields are highly responsive[13].
- Plant population and weeding quality also have large effects on yield. Late planting is estimated to reduce yield, but not as much as suggested by the original simulation results. This under-estimate is probably indicative of the effects of collinearity between rainfall and time of planting and hence of potentially biased estimates of their yield effects, and further illustrates the difficulties of estimating yield responses from regression models of survey data.

Overall these results (with local maize NUE varying from 10 – in phosphorus deficient soils without phosphate application - to 18 kg grain per kg yield, and hybrid maize NUE varying from 15 – in phosphorus deficient soils without phosphate application – to 29 kg grain per kg yield) suggest that incremental production impacts from incremental input use are a little higher than those used in benefit cost analysis in previous evaluation reports. However it may be thought that these estimates may err on the high side if they under-estimate (a) the extent of phosphorus deficiencies in Malawian soils, (b) the effects of late planting, (c) the effects of variable and patchy poor rainfall, and/or (d) the effects of pests and diseases. On the other hand previous analysis has not allowed for yield responses to phosphate fertilisers (and even if there are only limited immediate benefits there should be longer term benefits from the prevention of soil mining and yield impacts on more P sensitive leguminous crops grown as relay or intercrops) and it is likely that plant populations are higher than estimated here from farmers' reports of seed use. These results also suggest that previous estimates of the gains from increased adoption of hybrid seed were under estimated – although the effects of displacement on incremental seed use were not allowed for.

7.1.5 Incremental production estimates

The information presented above on NUE for nitrogen and the estimated yield effects of adopting hybrid maize instead of local maize allows, with farm survey information on cropping patterns and fertiliser application, estimation of incremental production as a result of the FISP. A complex spreadsheet was constructed with estimated NUE from the regression models described above applied to average patterns of crop management observed in 2012/13 household data for plots with subsidised fertiliser, and subsidised and unsubsidised fertiliser, by maize variety (local, OPV or hybrid)[14]. Separate and interactive incremental effects of incremental fertiliser and seed type were then estimated using survey data on fertiliser and seed rates, and these were related to subsidy

[13] Makumba et al. (2012) report low phosphate levels in soils in southern Malawi.

[14] The OPV NUE is assumed to be an average of hybrid and local maize NUE

sales reported by the Logistics Unit. This provided estimated incremental production before adjustments for

a. Discrepancies between estimated total subsidy receipts and disbursements, as discussed in section 6,
b. Discrepancies between NUE rates estimated from the crop simulation as described above and likely on farm conditions
c. The effects of displacement by subsidy sales of commercial seed and fertiliser sales that would have happened in the absence of the subsidy.

Table 7.3 sets out incremental production estimates with different assumptions on each of these issues. We consider fertiliser leakages from 5% to 20%, estimated NUEs from the crop simulation adjusted downwards by 10% to 30%., and fertiliser displacement ranging from 5 to 25%, and seed displacement ranging from 40% to 60%. These choices are informed by the following:

a. Potential discrepancies between household survey estimates of total receipt of subsidised fertiliser and MoAFS figures on total sales, depending on total numbers of rural households or farm families, as set out in table 6.1.
b. If roughly 25% of subsidised fertiliser is applied to plots mainly in the Southern region without complementary phosphate fertiliser then this is estimated to reduce the estimated NUE(N) for both hybrid and local maize by about 10%. We use this as our upper estimate for NUE.
c. Estimates of fertiliser displacement in Malawi have ranged from 3% in 2008/9, a year with very high commercial fertiliser prices (Ricker-Gilbert and Jayne, 2010), to 22% in 2006/7 (Ricker-Gilbert et al., 2010) with a more recent estimate of 15% in 2010/11 (Chirwa et al., 2011b). For seed Mason and Ricker-Gilbert (2012) estimate very high displacement of 56% in Malawi. However econometric estimation of displacement measures changes between seasons in the difference between beneficiary and non-beneficiary purchases of subsidised inputs. It does not, however, make any allowance for potential longer term and cumulative impacts of the subsidy in stimulating a general increase in input use by both beneficiaries and non- beneficiaries. As discussed in section 5, there is evidence of substantial growth in commercial sales of hybrid maize seed over the life of the subsidy, but not in fertiliser sales.

Table 7.3 therefore sets out estimated incremental production of maize under these different conditions, with the central cell highlighted, considered to be the most likely and approximate mean. This figure falls within the range of incremental production estimates made and used in evaluations of previous FISP seasons, with somewhat higher NUEs (18.4 and 14.4 as compared with 18 and 12 for hybrid and local respectively used in previous evaluations) and higher incremental effects of hybrid and OPV seed counterbalanced by somewhat higher estimates of leakage and displacement – with previous evaluations paying less attention to leakage or diversion. Inspection of the table shows that estimates are sensitive to changes in leakage and displacement and to changes in NUE[15]. They are less sensitive to changes in seed displacement. No account is taken of possible post-harvest losses.

[15] The table does not show any changes in production from changes to incremental benefits of hybrid seed without changes in fertiliser use, which are responsible for between 8 and 18% % of estimated incremental production, depending on NUE and displacement parametres used.

Table 7.3 Incremental maize production estimates under different assumptions

Seed displacement	NUE reduction	Hybrid NUE	Local NUE	Fertiliser displacement &leakage 10%	30%	45%
40%	-10%	22.1	17.5	1,038,563	828,267	670,545
	-20%	19.6	15.5	923,167	736,238	596,040
	-30%	17.2	13.6	807,772	644,208	521,535
50%	-10%	22.1	17.5	1,023,192	*812,895*	655,173
	-20%	19.6	15.5	909,504	***722,574***	582,376
	-30%	17.2	13.6	795,816	632,252	509,579
60%	-10%	22.1	17.5	1,007,820	797,524	639,802
	-20%	19.6	15.5	895,840	708,910	568,713
	-30%	17.2	13.6	783,860	620,296	497,623

No crop simulation yield information or estimates of displacement are available for estimating the incremental production of legumes from the distribution of subsidised legume seed, and yield estimates are complicated by variable intercropping patterns and, for beans, the picking of leaves as a vegetable. Yield estimates for legumes were therefore drawn largely from collation of results of on farm trials.

- For groundnuts, the legume for which most seed was distributed, an average yield of 8.3 kg of grain per kg of seed was calculated from 7 trials for CG7 planted in November and December. Inclusion of trials where planting date was not specified (but excluding those with planting from January onwards) gave a slightly higher average yield to seed ratio of 8.7 kg of grain per kg of seed from 21 trials for CG7. Yield records from 14 yield sub plots in Lilongwe gave an average of 10kg of grain per kg of seed at a lower plant density. We therefore use yields of 8 and 10kg grain per kg seed in our incremental production estimates.
- For beans, very little trial data on on-farm climbing beans yields could be found, but the few trials available suggest again 8 to 10 kg grain per kg yield.
- Evidence from on farm soya bean trials and MoAFS guidelines suggest the same range of yield to seed ratios (but it should be noted that since plant population rates and seed rates differ between crops and between intercrop and sole crop stands, the similar yield to grain ratios allow for a range of yields per ha between crops and different types of crop stand).
- The smaller grain sizes of cow peas and pigeon peas and their planting patterns mean that they have lower seed rates and higher yield to seed ratios than the large seeded legumes, with reviews of on farm trial data suggesting around 40 to 60 kg grain per kg seed for determinate cowpeas and 0 to 110 kg grain per kg seed for medium duration pigeon pea varieties such as Mwayiwathu Alimi. These ratios are highly variable (pigeon pea for example is very susceptible to pest attack and to early cessation of the rains limiting soil moisture for grain maturation). However the small quantities of cow pea and pigeon pea seed distributed under FISP mean that their overall contribution to incremental production is low, as is the sensitivity of overall production to errors or variation in these yield ratios.

Table7.4 sets out estimates for incremental production by type of legume, using the yield parametres described above. A high rate of displacement may be expected for some crops but not others (for example soya and to a lesser extent groundnuts) but the replacement of local varieties by certified seed for new varieties should mitigate against this. No attempt is made to value potential benefits to soil fertility and maize production. There is little evidence of benefits to maize yields from rotation with groundnuts or intercropping with beans (the two dominant crops promoted through subsidised seed) and unless the area under pure legume stands increases, the per ha soil

fertility benefits are likely to be small. However as argued by Chirwa et al. (2011a) if the use of inorganic fertiliser and hybrid seeds promoted by FISP can lead to higher maize yields and lower maize prices, then this may allow farmers to reduce the area under maize without compromising food security, making space for a legume rotation which would then allow them to reduce their reliance and expenditure on inorganic fertilisers (Snapp et al., 2010) while at the same time offering income and human nutrition benefits. If a crop is planted as a new sole crop then lost production of the other crop it replaces should be set against the incremental production (assuming land constraints) but the lack of information on this and small scale of the legume component in FISP suggest that there will be limited costs and benefits from this.

Table 7.4 Estimated incremental production of legumes under yield and displacement assumptions

Seed displacement	Legume crop	Seed supplied (MT)	Yield kg/kg seed		Incremental production	
			Lower	Higher	Lower	Higher
30%	Beans	6512	8	10	3,650	4,563
	Cow peas	41	40	60	1,138	1,707
	Groundnuts	1,867	8	10	10,455	13,068
	Soya	358	8	10	2,007	2,508
	Pigeon pea	56	40	110	2,240	4,299
50%	Beans	6512	8	10	2,607	3,259
	Cow peas	41	40	60	813	1,219
	Groundnuts	1,867	8	10	7,468	9,334
	Soya	358	8	10	1,433	1,792
	Pigeon pea	56	40	110	2,512	3,071

7.2 Crop and beneficiary household returns

Beneficiary households gain direct benefits from receipt of subsidised inputs in one of three different ways, depending on their use of the coupon and inputs:

a. an immediate cash benefit if they sell the coupon or input,
b. an immediate cash saving if the subsidised input displaces a full priced cash purchase they would otherwise make, or
c. increased value of production if they use the input on their own farm

The value of the benefit under (a) or (b) depends simply upon the price that they receive for selling the coupon or inputs under option (a) or upon the price they would have otherwise paid for the unsubsidised input under option (b), in each case adjusted for any buying and selling costs incurred. As noted in section 6, however, the majority of beneficiaries reported that they use the coupon to buy inputs which they then use in maize production on their farm.

Table 7.5 sets out estimated net benefits and VCRs (Value Cost Ratios) for the adoption of different subsidised and unsubsidised inputs. Full details of the calculations are set out in Annex A. NUEs used are reduced by 20% from those estimated using the crop simulation model (as discussed in section 7.1.4)[16]. Estimates are provided for different input adoption combinations, adding fertiliser to local maize, replacing local maize seed by OPV or hybrid maize seed on unfertilised or fertilised plots, or adding fertiliser and replacing local maize seed by OPV or hybrid maize seed (the full subsidy

[16] Fertiliser prices are average Urea and 23:21:0 prices reported by FAM (Fertiliser Association of Malawi), unsubsidised seed prices are the prices paid by MoAFS to seed suppliers (and may therefore be a slight under-estimate), fertiliser rates and subsidy redemption costs are calculated from the 2012/13 household survey, and wage rates from Lilongwe and Zomba surveys. Costs include transaction costs and incremental field and harvest labour.

package). Net benefits in MK/ha and VCRs are calculated with two maize prices, MK125 per kg (the average 2013/14 maize price predicted by MVAC) and MK100 per kg, a lower price more likely to be achieved soon after harvest. Points of interest from table 7.5 include

- All subsidised options yield extremely high VCRs, and for free OPV seed these are infinite;
- For unsubsidised inputs VCRs for OPV or hybrid seed fertiliser are high, VCRs for fertiliser application are lower but still around or above 2 at a price of MK100/kg, and are a little higher with a price of MK125/kg - suggesting that the use of unsubsidised fertiliser is basically profitable on hybrid maize (a VCR of 2 is normally reckoned as the minimum required to make fertiliser application profitable enough for smallholder farmers).
- A 'subsidy pack' of fertiliser applied at average rates provides a net incremental benefit to subsidy beneficiaries of a little under MK100,000 per ha on hybrid or OPV at a maize price of MK125 per kg and around half that on local maize. 1 bag of 23:21:0 and 1 bag of urea are enough for about 0.8ha of hybrid maize at average application rates reported in the household survey, but 5 kg of seed is enough for only about 0.4ha at reported average hybrid seed rate. If some of the fertiliser is applied to this 0.4 ha of hybrid then the remainder would cover a little under 0.6 ha of local maize. Together this would then provide an incremental benefit to a beneficiary household a little under MK70,000 at a maize price of MK125 per kg (or around MK50,000 at a maize price of MK100 per kg) – or more if they bought more unsubsidised hybrid seed. These represent a gain of 500 kg or more of maize per beneficiary household, or 200 to 400 kg of maize for households getting one fertiliser coupon without or with a maize seed coupon. This will of course vary with local soil and rainfall conditions and with plot management (principally time of planting, weeding, and plant density).
- All estimates take no account of possible post harvest losses.

Table 7.5 Estimated net benefit and VCR of subsidised and unsubsidised inputs

			Subsidised inputs				Unsubsidised inputs			
Maize price (MK/kg)			125		100		125		100	
Adoption	From	To	Net benefit	VCR	Net benefit	VCR	Net benefit	VCR	Net benefit	VCR
Fertiliser	Local no fertiliser	Local & fertiliser	47,185	65.8	35,098	52.6	22,042	2.3	9,955	1.9
OPV seed	Local no fertiliser	OPV no fertiliser	7,606	n.a.	5,795	n.a.	4,790	3.2	2,979	2.6
Hybrid seed	Local no fertiliser	Hybrid no fertiliser	24,216	111.1	18,388	88.9	17,265	4.0	11,437	3.2
OPV seed	Local & fertiliser	OPV & fertiliser	28,816	n.a.	21,955	n.a.	23,709	6.7	16,849	5.4
Hybrid seed	Local & fertiliser	Hybrid & fertiliser	57,265	187.2	43,543	149.8	47,552	6.8	33,830	5.4
OPV seed & fertiliser	Local no fertiliser	OPV & fertiliser	80,060	86.2	59,913	68.9	43,620	2.7	23,472	2.1
Hybrid seed & fertiliser	Local no fertiliser	Hybrid & fertiliser	97,376	87.5	73,079	70.0	59,587	3.1	35,290	2.5

Notes: Net benefit MK/ha
VCR = Value to Cost Ratio

7.3 Food Security, Health and Education

An immediate effect of the farm input subsidy programme on beneficiary household welfare should be to improve food availability and security at household level. Food security can also lead to medium and long-term benefits on health and education. In the absence of panel data, the effects of the subsidy programme are very difficult to infer as differences in the food security, health and education indicators between recipients and non-recipients of farm input subsidies may be the result of prior differences between the two groups (selection bias) and any impacts of subsidy receipt on beneficiary status are likely to take time and are difficult to detect in the year of subsidy implementation, Consideration of the effects of earlier subsidy receipt should be possible using methods such as propensity scoring, but this requires more time than is available for inclusion in this report. Nevertheless differences between beneficiaries and non-beneficiaries were examined for various food security, health and education related variables in the data set, and we briefly report on this work here, recognising that it may tell us as more about targeting (effective targeting should lead beneficiaries having worse scores than non-beneficiaries) than it does about subsidy impacts.

Several self-reported indicators are used to measure the food security, including adequacy of food production, adequacy in food consumption, food consumption and coping strategy indices. With regard to the incidence of smallholder farmers running out of own produced maize before the next harvest, it appears that households that report more receipt of subsidies in the past are more likely to report food shortages from own production. As noted above it is not possible without further work to determine from this the interactions between initial differences between the two groups and the impacts of subsidy receipt.

Analysis of households' perception of the adequacy of food consumption over the month and year preceding the time of interview suggest that households that have been recipients of subsidies in more seasons tend to report better food security outcomes than those that have received subsidies in fewer seasons.

Differences in food security measured by two indices of food security were also investigated. The Food Consumption Score (FCS), following World Food Progamme (2008), was computed as a composite score based on dietary diversity, food frequency and relative nutritional importance of different food groups consumed in the household during the previous seven days. The higher the score the more food secure is the household. Following Maxwell and Caldwell (2008), the Coping Strategy Index (CSI) was computed as the frequency of use of coping strategies over the last year is combined with severity weights. The CSI is a proxy for household food security interpreted such that the higher the CSI the more a household has to cope, indicating greater food insecurity. Strategies in the CSI include relying on less preferred foods, borrowing food or relying on friends and relatives, limiting portion sizes, restricting consumption by adults in favour of small children, and reducing the number of meals eaten per day.

Analysis of FCS among households with greater or lesser past receipt of subsidies shows generally adequate scores and no clear differential pattern. This is not surprising with the survey taking place at harvest time, and tells us little about food security problems experienced at other times of the year. With respect to the CSI, however, there is a clear negative relationship between times of receiving subsidies and the CSI, suggesting that recipients are less likely to be food insecure.

We further explored the relationships between farm input subsidy receipt and health and education using three indicators: incidence of illness in households in the past season, of under-5 illness, and of school attendance in households with school-going members. There is no clear relationship between the extent of subsidisation and the incidence of illness (averaging around 85%) or under-5 illness (averaging around 60%), With respect to school attendance rates, there is very little variation between households that have received more or less subsidies in the past, with all groups reporting average rates between 80 and 85%.

7.4 Vulnerability and Shocks

Poor households are susceptible to shocks and stresses. It is well documented that most shocks and stresses experienced by rural households in Malawi are agricultural related. These agricultural shocks may be in the form of crop/livestock failures or low yields, unexpected falls in produce prices and unexpected rises in food prices. However investigation of subsidy impacts on vulnerability and resilience to shocks faces the same challenges as those discussed earlier for food security, health and education.

A high incidence of shocks (over 80%) is reported among rural households in the past 2 seasons. This is not surprising as this period coincided with the period of a major policy shift on exchange rate management with devaluation in May 2012 and eventual floatation of the Malawi Kwacha resulting in increases in general prices. No clear relationships with subsidy receipt are apparent except that the incidence of agricultural related shocks (averaging over 50%) appears to be somewhat lower among households that have received subsidized inputs in more seasons.

7.5 FGD views on direct subsidy impacts

Views expressed in FGDs on the direct subsidy impacts appear to be quite nuanced in drawing a distinction between food security and wider livelihood impacts.

As regards the former, in discussion about possible graduation from the programme some participants likened reducing the number of recipients to committing murder, arguing that a reduction in the number of households receiving subsidized fertilizer and seeds would result in hunger in most parts of Malawi since they considered that most people survived on the little that they harvest using the subsidized inputs. Coupled with the poor rains and soils, they argued, not giving them subsidized fertilizer would result in serious hunger for many households. This suggests important production and food security benefits from FISP.

There was also a view, however, that Impacts of the 2012/13 FISP program on people's livelihoods are very small. Hardly noticeable impacts arise because amounts of inputs that people get are small, and this is exacerbated by their at times being forced to share the little they have with others. With population growth and stagnant beneficiary and coupon numbers it is impossible to notice any changes in people's livelihoods, or on the community. It was also recognised, however, that impacts for the ultra-poor are very significant in that it enables them to harvest a little which they were not able to do without the programme. Such impacts are not, however, large, in the sense that subsidy receipt reduces but does not by any means eliminate such people's food insecurity problems.

These nuanced views may be summarised and reconciled by recognising that although the amount of subsidy received by most people was too small to help them *advance* their livelihoods, by identifying the food security benefits of subsidised input receipt they implicitly recognised that it was helping them survive. In the terminology of livelihood dynamics this might be characterised as helping them *hang in*, but not *step up* or *step out*, which is of course their aspiration.

As reported in FGDs in previous years, there were also comments in some places that the programme would have had a good impact on yield had the rains been favourable. Again, as in previous years, some considered that the programme benefits people who were already doing a little better, because these people are able to buy coupons and subsidised fertilizers from the village head, and hence to harvest more.

In Dedza it was indicated by men that the real beneficiaries were vendors because they bought subsidized fertilizer and resold it at higher prices.

We return to these issues in the next section when we discuss FGD views on wider impacts of the programme.

8 Wider impacts

Throughout this report a distinction has been made between direct impacts of the programme on beneficiaries and indirect impacts on the wider economy and hence on both beneficiaries and non-beneficiaries. These wider impacts are set out in broad terms in the analytical framework to the evaluation set out in figure 1.1, and are caused by the secondary effects of direct impacts on labour, maize and other markets through changes in the supply and demand for labour and other goods and services.

The relationship between direct and indirect impacts in the rural economy is set out in more detail in figure 8.1. This identifies three possible uses of the subsidy by subsidy recipients: reselling of coupons or of subsidized inputs, use of the inputs with displacement of otherwise unsubsidised purchases (effectively increasing the cash available to the recipient household), and incremental use of the inputs in production (the real purpose of the programme).

In the first two cases the immediate income benefits should lead to a tightening of the labour market and a rise in wages, as poorer households hire out less labour (as their income from selling coupons allows them to hire out less ganyu to earn food) and an expansion of hired labour demand by less-poor households (who have more resources available to hire labour).Increased wages lead to immediate consumption gains to poorer households (recipients and non-recipients) and increased demand and growth in the wider rural economy should also benefit non-beneficiaries as well as subsidy beneficiaries.

Impacts of a subsidy are also expected in the season following its implementation: if households have increased stocks of grain produced with the subsidy this should reduce the need for pre-harvest purchases of grain by households with insufficient stored grain (lowering maize prices) and reduce the need for poorer households to hire out ganyu to earn cash and food (thus tightening the labour market and raising wages).

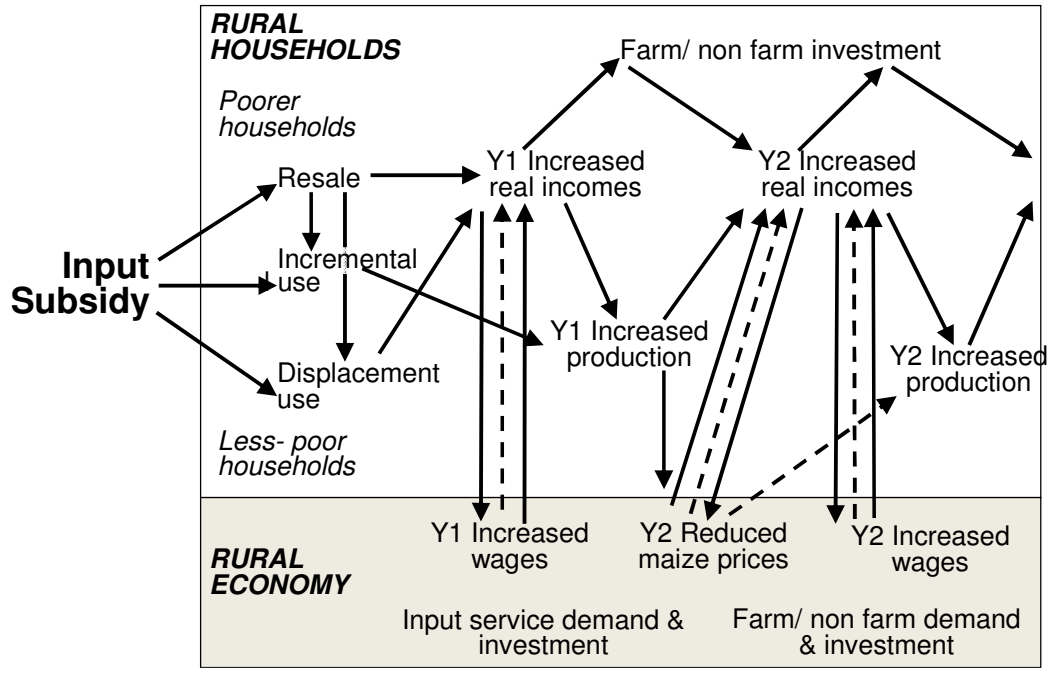

Figure 8.1 Potential rural economy impacts of the FISP

These indirect effects are very difficult to study. Macroeconomic effects (illustrated in figure 1.1) have been modelled with national CGE models by Buffie and Atolia (2009) and by Arndt et al. (2013), and the latter also consider maize price impacts. Dorward and Chirwa (2011) introduce rural economy growth (or multiplier) effects into benefit cost analysis, but do not attempt to actually

estimate the scale of the effects. Dorward and Chirwa (2012b) attempt to model the local economy interactions more directly in a partial equilibrium simulation framework, with strong modelling of household behaviour but more rudimentary modelling of rural economy linkages. There have also been attempts to look at impacts of the FISP on wages, both qualitatively (in previous evaluation reports) and using econometric techniques (Ricker-Gilbert (2011) finds small but significant effects).

In this section we introduce a new approach to examining rural economy wide effects and supplement this first with consideration of 2012/13 changes in maize markets and their implications for the FISP, and then with examination of wage rates.

8.1 Local Economy-wide Impact Evaluation of the FISP[17]

As noted above, the FISP has both direct and indirect impacts on Malawi's rural economy. It directly impacts the households that receive input subsidies. If fertilizer subsidies induce farmers to use more fertilizer and stimulate production, the full income of beneficiary households rises. However these households also gain income if they sell their coupons or if subsidies displace private input purchases, as farmers pay less for the fertilizer that they would have applied anyway. Whether the FISP induces extra production or displaces existing input use, it indirectly injects a considerable amount of cash into local economies, with beneficiary households the channel through which this cash enters local economies. As FISP households then spend this cash, the program's impacts spread to other households and businesses inside (and outside) the rural economy. Where the FISP leads to higher maize production by beneficiary households, this may lower maize prices, benefiting all consumers, not just beneficiaries.

8.1.1 The LEWIE Model

To investigate these processes and the local economy effects of the FISP on household income and welfare of both beneficiary and non-beneficiary households, we use a local economy-wide impact evaluation (LEWIE) modeling approach. This makes it possible to not only simulate the FISP's rural economy-wide impacts but also to understand what shapes these impacts and how complementary policies and programs might influence them. Our FISP LEWIE is based on the methodology developed by Taylor and Filipski (2014).[18]

LEWIE nests models of FISP-beneficiary and non-beneficiary households within a model of the rural Malawi economy. Each household model reflects the dual nature of agricultural households as both producers and consumers of crops. The rural economy-wide model explicitly captures the linkages between these two household groups, for example, the FISP households' demand for goods and inputs supplied by other FISP households or by households that do not receive the FISP subsidy.

8.1.2 Data and Parameterization of the Model

Our LEWIE model for rural Malawi and the individual household models constituting it were parameterized using data from the 2010-2011 Malawi Integrated Household Survey (IHS3). Econometric methods were used to estimate production functions and household-specific demand functions. These methods allow the estimation of both model parameters and their standard errors, giving the distribution of each parameter around its mean. Monte Carlo methods are then used to construct confidence bands around the simulation results. We also use sensitivity analysis to test the robustness of our results to alternative assumptions about how rural markets work.

The baseline model represents a rural economy in which there is unemployed labor, with a highly elastic supply of labor so that that production can expand and employ labor without putting

[17] The modelling and analysis reported in this section is the work of Karen Thorne and Ed Taylor.

[18] See also (Thome et al., 2013)

significant upward pressure on wages. It also assumes that households face liquidity or seasonal credit constraints reducing their ability to afford the purchasing of inputs. The model then describes two effects of cheaper inputs from the FISP, increasing the profitability of their use and the affordability of their purchase. Initial prices of maize, other goods, and labor are initially set using information from IHS3 data, but then change within the model as result of changing interactions between local supply and demand stimulated by changes in production and cash stimulated by the FISP. National maize prices are assumed to be largely insulated from world markets. The baseline model then simulates the impact of a 75% reduction in input price for the FISP-beneficiary households.

After simulating the impacts of the FISP using the baseline model, we test the robustness of our findings by repeating the simulation using a less constrained model, in which rural households do not face liquidity constraints. We also test whether the size of the FISP matters by simulating the impact of a smaller subsidy—25% instead of 75% of input prices. The purpose of this simulation is to explore whether diminishing returns to inputs substantially reduces the effectiveness of the FISP at raising production and incomes, and whether a scaled-back program might lead to a cheaper and more cost effective and efficient programme.

8.1.3 Simulations and Results: Rural Economy-wide Impacts of the FISP

Table 8.1 describes predicted impacts of the FISP on real incomes in rural Malawi, with the income effects of the FISP in the baseline model summarized in the first data column (the second and third columns present other models' results and are discussed below). The model distinguishes between two types of benefit generated by FISP: higher income, principally for beneficiary households, and lower food prices, which benefit both beneficiaries and non-beneficiaries. Changes in real incomes (cash incomes adjusted for prices) reflect both of these benefits. The baseline simulations find that the FISP generates a total real income multiplier of slightly more than MK 2 per MK of program cost, with a 90% confidence interval of MK 1.91 to 2.10. That is, each Kwacha of subsidy creates an additional Kwacha of spillovers. Most of this spillover—MK 0.63—accrues to the beneficiary households. That is, beneficiary households receive the Kwacha of subsidy plus an additional MK0.63 in real income spillovers (from reduced maize prices and increased local business and employment opportunities). Nevertheless, the FISP also creates positive real income gains for non-beneficiaries, as well. Non-beneficiary households' real income rises by MK 0.37 per MK of subsidy to beneficiary households. This finding highlights important positive impacts not documented by FISP evaluations that focus exclusively on the beneficiary households or ignore the effects of transfer benefits and their spillovers on beneficiaries. These estimates of spillover effects are higher than those estimated by Dorward and Chirwa (2012b) for both beneficiaries and non-beneficiaries, but show a similar relationship, with higher spillovers for non-beneficiaries.

Table 8.2 sets out estimated production impacts from FISP, with the first column again presenting the results from the base model. Income multipliers are generated from FISP's production impacts, which vary by sector and household group. FISP therefore has its largest impact on maize production with the real value of maize output increasing by 1.53 per Kwacha of subsidy in the baseline model. There are substantial positive effects on other sectors, for example other crops (0.95) and retail (0.20).

Table 8.1. Impacts of the FISP on Real Incomes in Rural Malawi

Outcome	Model		
	BASE MODEL	No Liquidity Constraint	Lower Subsidy Rate
Elasticity of Labor Supply	100	100	100
Liquidity Constraint (1=yes)	1	0	1
Subsidy Rate	0.75	0.75	0.25
iterations	501	501	501
MULTIPLIERS			
Total Real Income	2.01	2.04	1.15
90% CI	(1.91- 2.10)	(1.94- 2.15)	(1.10- 1.21)
By Household Group			
A: Beneficiaries	1.63	1.94	0.96
B: Non-beneficiaries	0.37	0.1	0.19

Table 8.2. Production Impacts of the FISP

Outcome	Model		
	BASE MODEL	No Liquidity Constraint	Lower Subsidy Rate
Production			
Maize	1.53	1.6	0.81
90% CI	(1.37- 1.68)	(1.37- 1.83)	(0.73- 0.88)
Ag Retail	0.05	0.04	0.02
90% CI	(0.04- 0.06)	(0.03- 0.05)	(0.02- 0.03)
Other Crops	0.95	0.96	0.53
90% CI	(0.83- 1.08)	(0.83- 1.11)	(0.47- 0.60)
Livestock	0.07	0.07	0.04
90% CI	(0.04- 0.09)	(0.04- 0.10)	(0.03- 0.05)
Retail	0.2	0.26	0.12
90% CI	(0.14- 0.26)	(0.18- 0.34)	(0.08- 0.16)

By stimulating input use, the FISP has a positive productive impact on the beneficiary households (see Table 8.3). Maize production by these households increases by MK2.24 per Kwacha of subsidy. Non-beneficiary households' maize activity does not benefit from the FISP but is adversely affected by lower maize prices, and it must compete with beneficiary households for labor and other inputs. The simulations show a small but positive impact of FISP on wages, but the model's structure means that this is likely to be an underestimate. Non-beneficiary households' maize production value therefore drops by MK0.71 per Kwacha transferred to beneficiary households. However non-beneficiary households' benefits from the higher consumption demand in the rural economy more than make up for this. The value of retail sales increases by MK0.2 per Kwacha of subsidy, and nearly all of this gain accrues to the non-beneficiary households.

Table 8.3.Production Impacts by Household Group

Outcome	Model		
	BASE MODEL	No Liquidity Constraint	Lower Subsidy Rate
	Production Multiplier by Household Group		
Maize			
A : beneficiaries	2.24	3.15	1.23
B: non beneficiaries	-0.71	-1.55	-0.42
Ag Retail			
A : beneficiaries	0.63	0.65	0.3
B: non beneficiaries	-0.58	-0.61	-0.28
Other Crop			
A: beneficiaries	1.25	1.46	0.72
B: non beneficiaries	-0.3	-0.5	-0.19
Livestock			
A: beneficiaries	0.07	0.07	0.04
B: non beneficiaries	0	0	0
Retail			
A: beneficiaries	0.01	0.01	0
B: non beneficiaries	0.19	0.25	0.11

We now turn to consider the alternative model specifications outlined earlier.

The second data column in each table reports FISP multipliers when liquidity constraints are not present. The “No Liquidity Constraint” column reveals that real income and production effects are smaller—though only slightly so—if households are not liquidity constrained. This result suggests that as modeled the most important impact of FISP is via lower input prices rather than via a loosening of liquidity constraints on input purchases. This may be the result of a lack of differentiation in the model between poorer and less poor, more and less liquidity constrained households, or due to difficulties in modeling seasonal constraints, but it may nevertheless provide realistic estimates given the limited extent to which FISP is successful in targeting poorer households, as discussed in section 6. The largest difference between the baseline model and the model without liquidity constraints is in regard to maize production impacts (see table 8.2), for which the FISP multiplier is larger in the unconstrained model. Given that households must come up with the liquidity to purchase inputs (albeit at a subsidized rate), the subsidy stimulates crop production more when such constraints are not a major factor. However these results are likely to be sensitive to the scale of subsidy modelled, the specification of household typologies, and the ways that liquidity constraints and subsidy rationing are modeled.

The third data column in each table presents multipliers from a very much scaled-back FISP, in which subsidies constitute a smaller share of input prices (25% instead of 75%). If there are sharply diminishing returns to inputs in crop production, we would expect the FISP multipliers to be larger for smaller subsidies as appears to be the case when comparing the 95% and 75% subsidies earlier. However our findings show the opposite here: the real income and production multipliers, it seems, would be uniformly smaller if the FISP were scaled back to cover a smaller share of input costs for beneficiary households. This is not surprising given the very low rates of modern input usage among Malawi farmers and the way that a subsidy has to be implemented at a large scale if its impacts on beneficiaries are going to have a substantial impact on the wider rural economy and on non-beneficiaries within that economy. This conclusion is likely to be strengthened by more accurate modeling of rationing and liquidity constraints in the model. However the benefits of reduced

government expenditure and 'crowding out' of government expenditure on other sectors or on other activities within agriculture are not allowed for.

8.1.4 Summary

The development and application of the LEWIE model to investigate economy wide impacts within the rural economy has yielded a number of important insights, demonstrating the potential importance and possible scale of these impacts, and teasing out their effects on different elements of the economy – maize production, production in other sectors, maize prices, and an increasing diversification of the economy. This supports arguments that the FISP has a potentially important role in driving wider growth within Malawi (see for example Chirwa and Dorward (2013a) or Chirwa et al. (2011a)) and points to the need for complementary policies that will support and extend FISP's very significant positive potential for driving growth in rural areas and in the Malawian economy as a whole. It is also important for discussions about the future role and scale of the FISP. In this it complements the more country wide CGE analysis of the FISP, which also demonstrates positive spillovers, from a different perspective and using different methods.

However, like all models (and as a model still being developed), it does not at present attempt to describe all elements of the Malawian rural economy that affect the way that FISP may impact different households and the interactions between them – such as seasonality of peak labour demands in crop production, subsidy rationing, liquidity constraints and wages; differentiation between areas with different agro-ecological and socio-economic characteristics and structures (affecting for example maize productivity, land holdings, economic activity, poverty incidence, and labour markets); and differentiation between household types within areas as regards land holdings, labour and dependency ratios, off farm income, and seasonal labour and liquidity constraints. Ideally further development of the model should address these issues, and there is also a need to investigate the sensitivity of findings to structural assumptions and specifications (for example supply elasticities, the maize production function, the endogenous determination of maize prices, different assumptions about liquidity constraints, and the impacts of allowing for some of the issues discussed above).

A particularly important issue here is the assumption that maize prices are endogenously determined. In the past this appeared to reflect Malawi's domestic prices normally lying between widely spaced import and export parity prices (except in years of exceptionally low production). Recent events, however, suggest that this is no longer the case. In the next section we therefore turn to examine the changing nature of the relationship between domestic and external prices, and their implications for FISP and more widely for the Malawian economy and the welfare of Malawians.

8.2 Diversification

One of the effects of increased maize productivity from greater use of improved maize seeds and of greater availability of legume seeds should be a process of diversification out of maize. Two different processes should be at work here:

- increased maize productivity among beneficiaries should lead to reduced need to plant larger maize areas to achieve the same production, and
- increased access to legume seed among beneficiaries should promote more legume cultivation through both greater access to seed and higher yielding seed (although there may also be some displacement of existing seed use).

Lower maize prices relative to wages could also lead to wider processes of diversification if maize becomes relatively less profitable – though this would depend upon relative potential prices of and incomes from other crops – and as discussed later maize prices have also been affected by wider economic and other events. On the other hand falls in tobacco prices in some years might be expected to increase relative cultivation of maize.

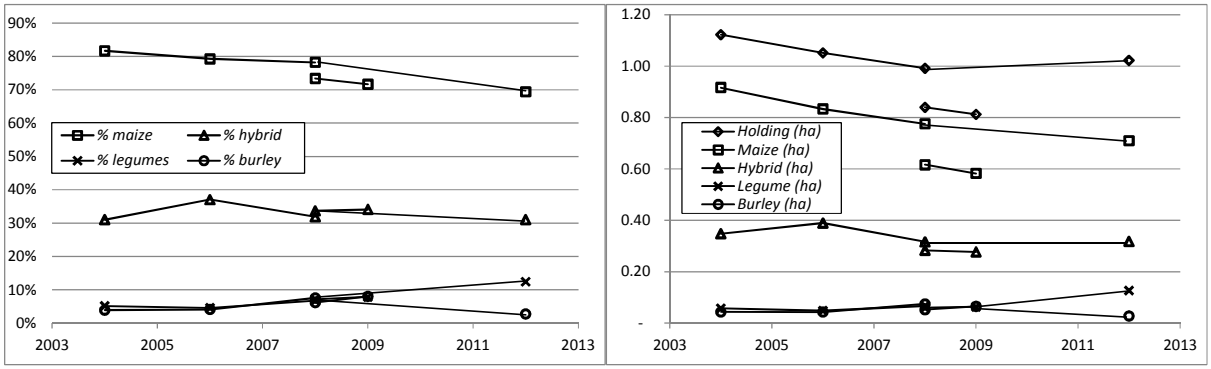

Figure 8.2 Changes in estimated holding cropping patterns, 2004/5 to 2012/13

Figure 8.2 shows cultivated holding sizes and areas per holding under different annual crops (specified as the most important crop in each plot) in ha and as % of holding[19] as estimated from different nationally representative surveys in the period 2004/5 to 2012/13[20].

A number of points of interest may be noted from figure 8.2.

a. There is an apparent trend for holding size to decline over the period of study, but the rate of decline suggested by IHS2 and the AISS and FISS survey is lower than would be expected from simple application of population growth rates, presumably as a result of some extension of cultivated area(the decline from IHS2 to IHS3 is considerably faster than this, perhaps linked to methodological changes in collection of data on plot and holding sizes);

b. There is a clear trend of declining proportion of the holding under maize cultivation and in declining area under maize;

c. The proportion of the holding under hybrid maize is, however, relatively constant, as is the area per holding under hybrid maize (although the area per holding may have fallen somewhat after 2006/7, and it should be noted that constant or small falls in area per holding may be occur even as the total national area increases, due to increasing numbers of holdings);

d. There appears to be fairly consistent increases in the proportion of land main-cropped with legumes, principally groundnuts but also soya (intercrops also include beans, pigeon peas and cowpeas).

e. The area under tobacco rises in 2008/9 and 2009/10 but then falls back in 2012/13.

This pattern suggests that intensification of maize production is occurring, together with some diversification out of both maize and tobacco, consistent with FISP supporting such diversification. Evidence for FISP promoting diversification is provided by (Karamba, 2013) whose analysis of the IHS3 uses instrumental variables to isolate programme effects and finds thatreceipt of any form of subsidy voucher in 2009/10 “leads to a substantial decrease in the share of land allocated to maize, which suggests intensification in the production of maize” (*op.cit.*, abstract). (Holden and Lunduka,

[19] Cassava is included as an annual crop in line with data collection protocols used in IHS2 and in the AISP/FISP surveys. In IHS3 cassava was considered a tree crop, but the calculations in Figure 8.2 include cassava plots.

[20] Data points are referenced by the year of planting, with 2004/5 (including some 2003/4 plots) from IHS2, 2006/7 and 2008/9 from AISS1 and AISS2, a second 2008/9 data point and 2009/10 from IHS3, and 2012/13 from FISS4. FISS3 (2010/11) was not nationally representative. IHS3 data protocols were different from the protocols in other surveys and are therefore connected by different lines. All areas are farmer estimates.

2010b) also estimate that rising maize yields are associated with small falls in overall maize area and maize area share (with a net increase in maize production). (Chibwana et al., 2012), however, estimate positive correlations between subsidy receipt and maize and tobacco[21] areas in a small study of 380 farmers intwo districts in Malawi. (Karamba, 2013)however suggests that the method used by (Chibwana et al., 2012) may produce inconsistent results with small samples.

8.3 Maize markets

An understanding of maize markets and prices is important to FISP for three main reasons:

- One of the benefits from FISP should be a fall in maize prices relative to the incomes of poor consumers, and this depends on maize prices and wages
- The economic benefits from FISP depend upon maize prices, with high maize prices leading to higher estimated value of the increased output from FISP to producers, while falls in maize prices as a result of FISP are important benefits to consumers
- Consequently determining the prices to use in FISP benefit cost analysis is critical for estimating the economic returns to FISP

These issues must be considered in the wider context of the importance of maize prices, relative to incomes, for poor Malawian consumers, many of whom are farmers, and for the Malawian economy as a whole.

In this examination of maize markets and prices we consider the complex interplay of prices, production, market structures, and policy interventions. The section builds on a large literature on maize markets in Malawi, but suggests recent, on-going and rapid changes in the regional market context. These changes pose major challenges to the welfare of poor Malawian consumers, to household and national food security, and to Malawi Government policies regarding domestic prices and the FISP itself.

8.3.1 Market structures and policies

There is a long standing and extensive literature[22] that describes changes in market policy in Malawi (notably regarding the role of ADMARC), the growth of market trading, and the extent of competition among maize buyers (and the extent of monopsony power exercised by ADMARC or its agents and by private traders). It is clear from this literature that there is significant correlation and interaction between markets, that there is increasing penetration of markets by maize buyers, and that mobile phone penetration is improving farmers' marketing information and power – but this is still highly variable, and there are concerns about reliability of weighing scales and about pressures on farmers to sell to the first rather than the highest bidder. At the same time there has been declining ability of ADMARC to defend either minimum or maximum prices, due to frequent policy changes and cash flow constraints, but nevertheless fear among traders of risks in large scale imports or storage as a result of government intervention in markets (through price setting or direct importation). Tschirley and Jayne (2010) and Ellis and Manda (2012) examine the consequent dysfunctional and self-perpetuating interactions between government and private traders in the face of fluctuating domestic production. These interactions tend to lead to delayed imports and excessive price swings and volatility. We suggest below that these interactions may also undermine the potential and fundamental benefits of the FISP in stabilising and lowering maize prices in the face of both normal seasonal variation between harvests and shocks affecting specific seasons – as a

[21] The study was based on data collected in 2009, when tobacco fertilisers were also subsidised alongside maize subsidies.

[22] See for example (Chirwa and Zakeyo, 2006; Dorward and Chirwa, 2010a; Ellis and Manda, 2012; Gabre-Madhin et al., 2001; Kherallah and Govindan, 1999; Manda, 2010; Mapila et al., 2013; Meyers, 2008; Tschirley and Jayne, 2010; Zeller et al., 1998)

result of adverse rains, or policy or economic shocks such as major devaluations or government supported exports. The continuing vulnerability of poor Malawian farmers, the reliance of many on market purchases to top up their own meager production, and the need for many sellers of maize to sell quickly have not changed.

While internal policies and market structures and conduct have been changing, external market conditions have also been changing, with rising maize prices among Malawi's regional neighbours. World prices have risen and become more volatile since a large world price hike in 2008, while in addition to Zimbabwe's earlier move from grain exporter to grain importer there is recent anecdotal evidence that rapid and massive growth in the coal industry in Tete, Mozambique, has created a new centre for food demand.

8.3.2 Maize prices, imports and exports

The interactive effects of external and internal trends, shocks and seasonal cycles can be seen by comparing domestic and regional prices. These are shown in figures 8.3 to 8.4 and in figure8.5 we compare these with available data on net imports and exports

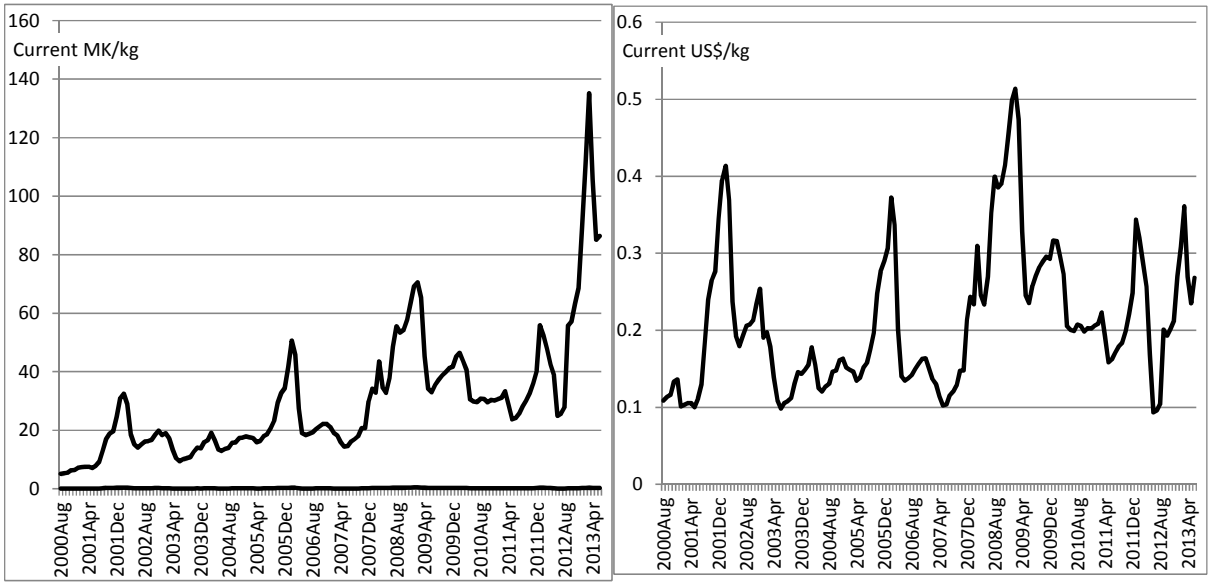

Figure 8.3 Monthly Malawi domestic prices in Malawi Kwacha and in US$ equivalents (at official exchange rates)

Source: MoAFS monthly market price survey

Figure 8.3 shows domestic monthly Malawi prices from 2000 to June 2013 averaged over the markets where the MoAFS monitors prices. The left hand panel shows current prices in Malawi Kwacha. Four features of the price series should be noted

- There are four periods with price spikes: at the end of 2001/ early 2002, late 2005/ early 2006, late 2008/ early 2009, and late 2012/ early 2013 – but the 2008/9 spike extends to 2009/10, while the much greater 2012/13 spike is also preceded by a smaller one in 2011/12.
- There is a clear seasonal pattern of low prices after harvest in the middle of most years rising to the pre-harvest period early in the following year.
- There is a steady rise in 'base' prices from 2000 to 2011.
- The 2012/13 spike is quite exceptional with prices increasing by a factor of 6 in just a few months of rapid inflation and devaluation of the Kwacha.

Changes in the value of the Kwacha are allowed for in the right hand panel of figure 8.3, which shows the domestic maize prices of the left hand panel converted into US$ using current exchange rates each month. Some aspects of the pattern are similar (the four spikes and annual seasonal fluctuations) but others are markedly different – there is no steady rise in base prices and most strikingly the 2012/13 spike is lower than the other three, and very similar to a fifth, 2011/12, spike. Given that national 2012 maize production was not considered to be particularly low, despite local problems in a number of areas, this raises a question about the reason for the very high increases in domestic prices in 2012/13. We address this question below.

First, however, we ask which of these price series and patterns is most relevant to different stakeholders, to policy, and to the FISP. The similarities across the two series are clearly of wide relevance. The role of dysfunctional interactions between policy and private traders/ importers in causing major spikes has been discussed above in terms of the analysis of Tschirley and Jayne (2010) and Ellis and Manda (2012). Traders' mistrust is also likely to exacerbate seasonal fluctuations since it depresses the incentives for traders to invest in seasonal storage (in both facilities and in stock). These difficulties are made more problematic by the major difference between the two panels in figure 8.3, the extraordinarily high 2012/13 price spike in Kwacha terms, which is much lower in US$ terms. For Malawian consumers, Malawi Kwacha maize prices need to be compared with wages (Dorward, 2013) and, as shown later in section 8.3, wage rates did not rise much in Kwacha terms in 2012/13. Malawian consumers therefore faced, and continue to face, very high real maize prices, as suggested in the left hand panel of figure 8.3. For maize traders, however, the US$ maize prices need to be compared with export parity prices to determine if exports will be profitable (that is cheaper than in neighbouring countries). Figure 8.4 therefore shows two different comparisons of Malawi domestic prices in US$ terms against regional prices which give some indication of export parity prices.

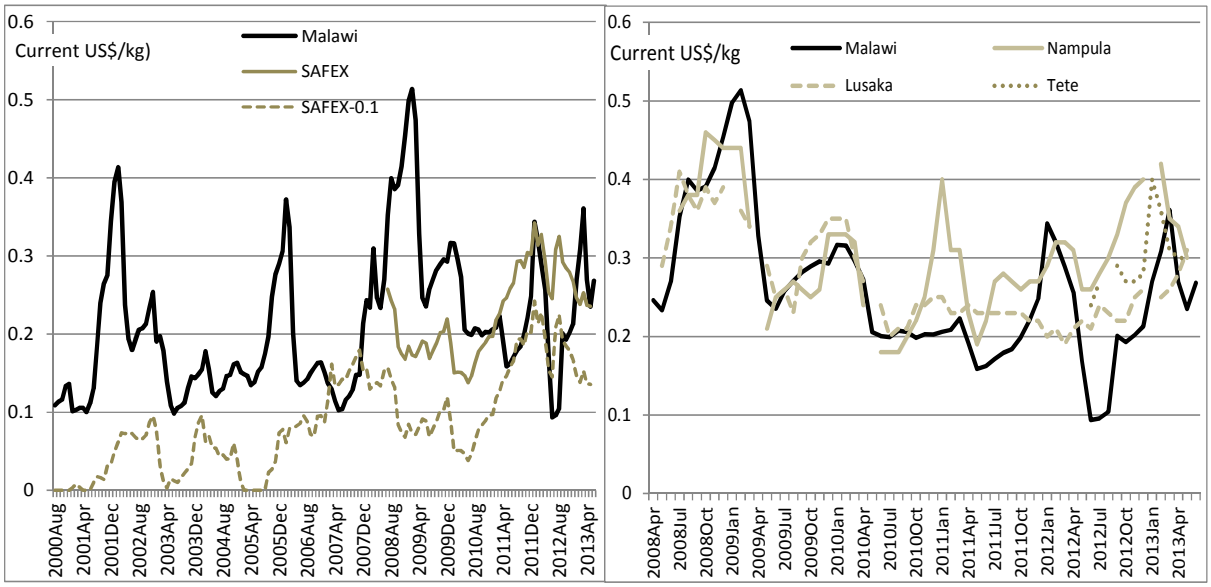

Figure 8.4 Monthly Domestic and Regional prices in US$$ equivalents (at official exchange rates)
Sources: MoAFS monthly market price survey; SAFEX; FEWSNet Monthly Price Watch

The left hand panel of figure 8.4 shows Malawi domestic prices in US$ terms (as in the right hand panel of figure 8.3), and compares this with SAFEX prices. Two SAFEX price lines are shown, the upper line is the SAFEX price, the lower line the SAFEX price minus US$0.1/kg to represent the approximate costs of transporting maize from Malawi to South Africa. This has in the past been accepted as roughly representing the normal export price that can be achieved. Examination of this shows that it has in general risen over the period , with high prices in 2008 which fell back somewhat

in 2010, but not as low as 2000, 2001 and 2003 prices. This pattern largely reflects increasing and increasingly volatile global prices for maize. The domestic Malawi price briefly fell below this 'SAFEX-0.1' price in 2007 and again in 2012. This suggests that there were incentives for Malawian grain traders to export maize at these times. The graph also, however, recognises that minus US$0.1/kg transport costs may no longer be the appropriate export parity price for Malawi as countries in the region with maize deficits (such as Zimbabwe) face an import parity price of the SAFEX price *plus* transport costs from South Africa. Malawi's consequent opportunity to export to these countries means that the export parity price should be somewhere around the SAFEX price. With this situation becoming increasingly prevalent from the mid-2000s, this suggests that while there were very limited if any incentives for exporting maize prior to 2007, there were substantial incentives in 2007, 2011 and 2012[23].

This then suggests an explanation for very high domestic price increases in 2012/13 if the devaluation of the Malawi Kwacha in mid-2012 led to domestic prices falling below export parity prices, and subsequent exports then sucked maize stocks out of Malawi leading to shortages later in the season. These export induced shortages then explain the high domestic prices in late 2012/early 2013.

This analysis is supported by examination of the right hand panel of figure 8.4 which shows prices collected by FEWSNet for Nampula, Lusaka and Tete (unfortunately only for the limited periods shown). No data are available for 2007, but while Nampula, Lusaka and Malawi prices were fairly similar from 2008 to 2010, this was not the case in mid-2011 and mid-2012 when Malawi prices fell below the other prices, again suggesting incentives to export.

The analysis is also supported by examination of import and export data shown in figure 8.5. Here the left hand panel shows official annual maize trade statistics from 2000 to 2010, and the right hand panel shows informal monthly maize trade statistics for 2008 to early 2013. The left hand panel shows large maize exports in 2007 (following large imports in 2002 and to a lesser extent in 2005) while the right hand panel shows large net maize exports in mid-2010 and smaller net exports in 2012/13 (when there was an export ban in place, which is likely to have led to both a reduction in exports and under reporting).

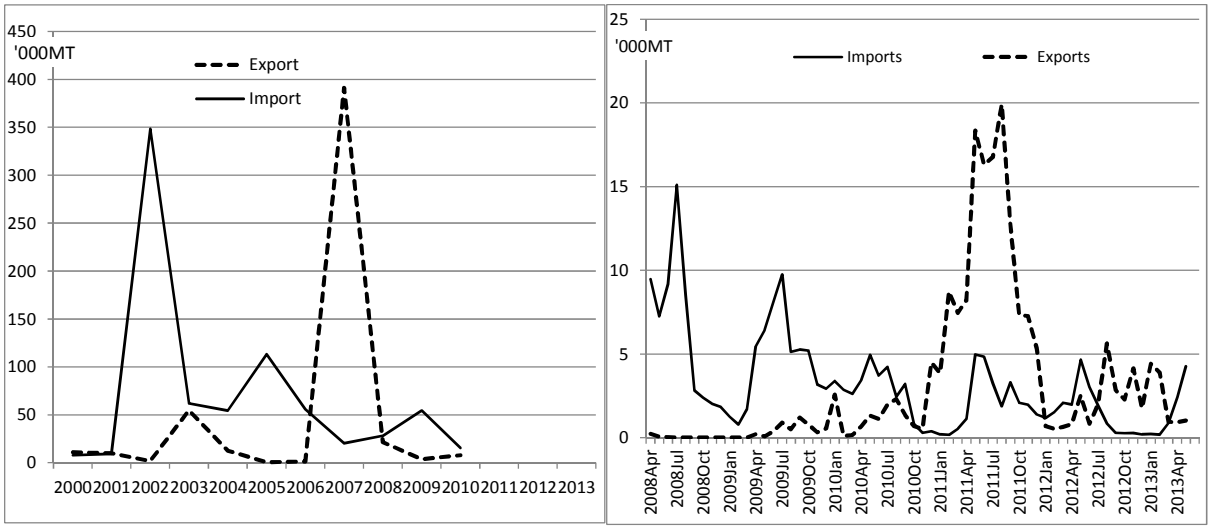

Figure 8.5 Annual formal and monthly informal imports and exports
Sources: FAOStat; FEWSNet

[23] We do not present any information about possible exports and export parity prices to Kenya.

8.3.3 Policy challenges and options

The situation outlined above, with changes in international and regional maize markets combining with the very large devaluation of the Malawi Kwacha to make the export of maize profitable despite very high Kwacha denominated prices for local consumer, poses severe policy challenges to the Malawi Government. These are well recognised, as shown, for example, by statements by the previous Minister of Agriculture in April 2013 that Malawi's problem is that its maize prices are too low. The problem is particularly severe because of the lack of trust between private traders and government, and hence incentives for traders to export when maize is cheap in the post-harvest period rather than store it for domestic resale when prices rise later in the year. This then leads to even greater price swings and higher spikes in the following pre-harvest period – as shown by very high prices in 2007/8, 2011/12 and 2012/13 after low prices and exports in mid-2007, mid-2011 and mid-2012. The result is the paradoxical and damaging situation that a large harvest leads to immediate low prices that stimulate exports that in turn may lead to higher and very harmful prices later in the season. This is a serious problem not only for general welfare and growth in the economy, it also poses a specific problem for the FISP: if the FISP is supposed to raise production but much of the extra production is then exported at low prices and there is no benefit to Malawian consumers from low prices later in the year, then the benefits from FISP are largely captured by consumers outside Malawi, and the food security and growth returns to Malawi from the FISP are severely undermined.

Policy options for addressing this problem are limited. The policy adopted by the government over many years has been to impose export bans. This no doubt has some effect, but the porous borders between Malawi and its neighbours make it very difficult to enforce such a ban, and it is widely believed that there are still significant exports despite a ban. At the same time the imposition of export bans contributes to policy instability perceived by traders, particularly when such bans follow early announcements of export surpluses. The result is an increase both in mistrust of policy and in risks from investment – the problem discussed by Tschirley and Jayne (2010) and Ellis and Manda (2012). These authors suggest that this can be addressed by the establishment of long term 'rules' which state clearly the conditions under which export bans and other policy interventions will be made: these rules must then be consistently implemented by policy makers – but this is not easy when maize prices are (rightly) an intensely political issue. A transparent system of export tariffs might address some of the difficulties of an export ban, but enforcement would still be a problem.

However one issue that could be addressed immediately and that could help address the problem in the short term would be for government to develop a more transparent and independently verifiable system for estimating annual crop production, particularly of maize. A variety of options could be explored here, including combining the use of satellite and rainfall information with crop simulation modeling of the type discussed earlier in section 7.

A specific option that should be considered is to examine ways that can actively provide incentives for traders to invest in domestic storage and stocks for later resale. This might be achieved by, for example, greater use of warehouse receipt systems and imaginative use of options and contracts for government to buy specified (and possibly bonded) maize stocks at a minimum price in the pre-harvest period while allowing traders to sell these stocks domestically themselves on or after a specified date if local prices were higher. Such measures could provide traders with the incentive to engage in storage, act to reduce maize exports and stabilize seasonal maize prices, and work to build up a more effective and more efficient maize market system. They may also need to be accompanied by measures that will relieve credit constraints on traders and the consequent need to turn stocks over quickly. The development of such instruments is beyond the scope and expertise of this evaluation, but highly relevant to the ability of the FISP to deliver major benefits to the Malawi people and their economy.

Finally, government may itself engage in seasonal maize storage as part of its strategic grain reserve activities. Given the difficulties and very large costs involved in managing the SGR and the likely negative impacts on private incentives to enter the seasonal storage activities, it is likely to be much better for this to be entered into only as a means of supporting private sector engagement, rather than as a substitute for it.

8.4 Labour markets

As discussed earlier, one of the pathways through which the farm input subsidy can affect growth and poverty is through effects on wages within the rural economy. In Malawi, *ganyu* labour is one important source of income for the poor and a common coping strategy for food deficit households. The household survey data revealed that about 24% of households that experienced food shortages from own production following the 2011 and 2012 harvests went for *ganyu* to earn income to purchase food. For such people an increase in the maize purchasing power of wages can help alleviate poverty and stimulate growth in the economy.

Figure 8.5 shows *ganyu* wage trends and tobacco prices relative to maize prices based on household information on the prices experienced or observed at different time periods. Panel (a) shows a lot of price variability of maize prices across districts, but consistent patterns of change with July 2012 prices much higher than July 2011 prices and January 2013 prices much higher than January 2012 prices. January prices are also much higher than July prices. In panel (b) tobacco prices also rose between July 2011 and July 2012, and relative to maize prices there was an increase in real tobacco prices.

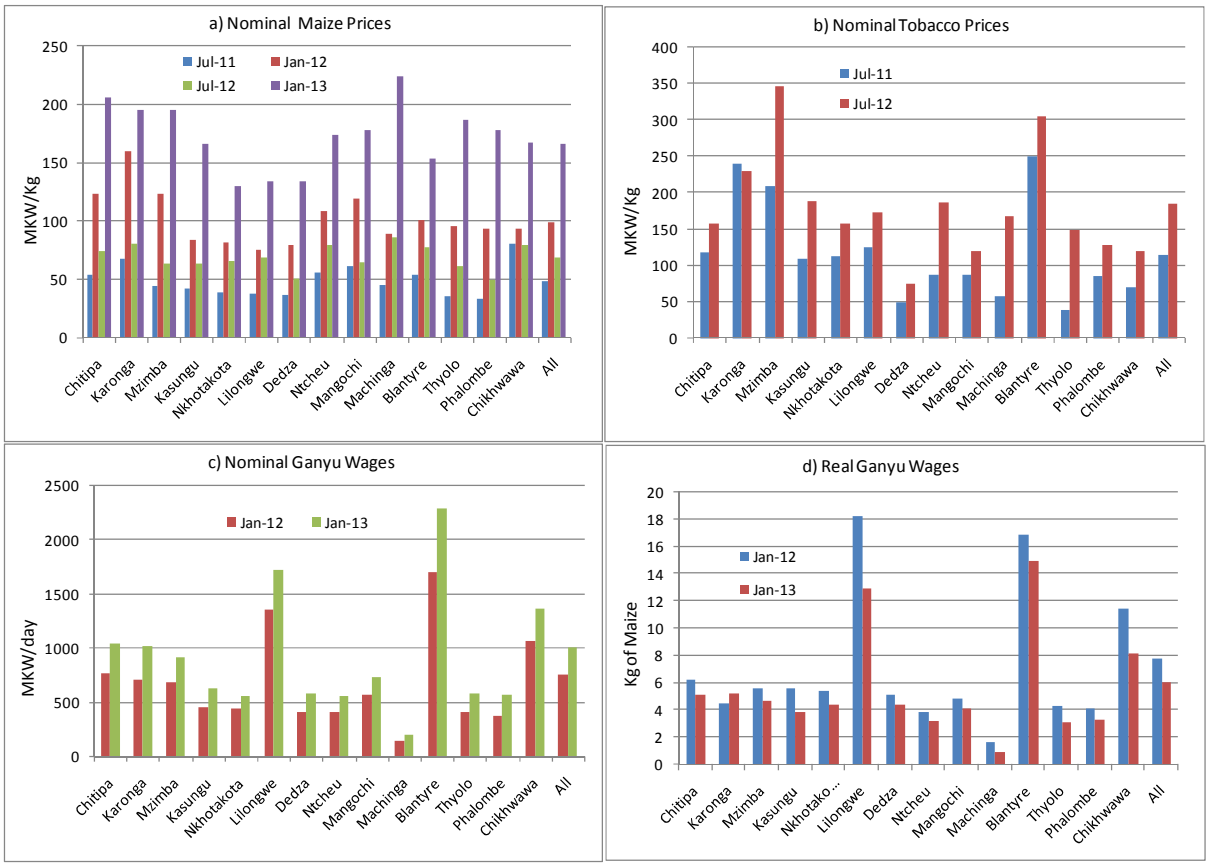

Figure 8.6 Average maize prices, tobacco prices and *Ganyu* wages 2011 - 2013

Source: Computed by authors based on FISS4

Panel (c) of figure 8.6shows the *ganyu* wage developments with nominal price increases across all districts. The lowest wages were in Machinga while the highest wages were recorded in Blantyre and Lilongwe (reflecting likely urban effects). Panel (d) shows real *ganyu* wages measured in the amount of maize which could be purchased by the average daily wage incomes. There is a general decrease in real wages across the districts, with the exception of Karonga. Overall, there was an estimated 22% decrease in real *ganyu* wages, with the highest decrease of 43% in Machinga. Such decreases in real wages undermine the effects of the subsidy on poverty reduction and rural economic growth.

In the resident enumerator survey, data on labour markets were collected every month between November 2012 and April 2013 in Lilongwe and Zomba. Figure 8.7 shows the monthly money wages earned from *ganyu* by households in Lilongwe and Zomba. November was the month over which wage incomes were highest. However, wage incomes almost remained flat between December 2012 and March 2013, which is also a lean period in terms of food availability in Malawi. Average daily *ganyu* wage rates have been increasing since December 2012, but despite this it appears that demand for *ganyu* labour was not readily available. This implies that households that had food shortages from their own production and rely on *ganyu* will have struggled during the lean season given the high maize prices, with negative consequences on their welfare.

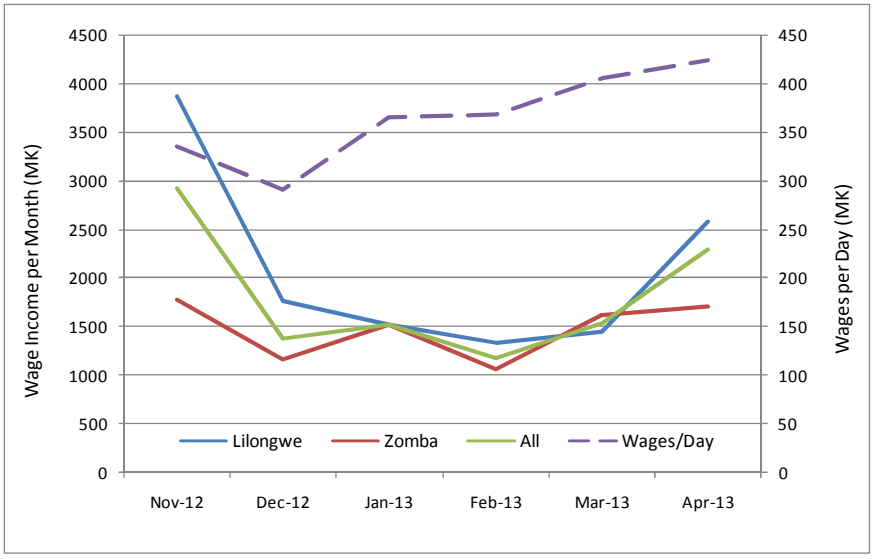

Figure 8.7 Seasonal*Ganyu* wages in Lilongwe and Zomba, 2012 - 2013
Source: Computed by authors based on RES Survey

It is not possible to tease out the impacts of FISP on these wage rates. There is evidence that FISP has stimulated wage rate increases in the past, for the benefit of the poor (see for example (Chirwa and Dorward, 2013a)) and it may be that the FISP has mitigated the fall in wages experienced as a result of wider changes in the Malawi economy, but it is not possible to demonstrate this.

8.5 FGD views on wider, direct subsidy impacts

Earlier discussion in section 7 of FGD views on the direct impacts of FISP suggested that they recognised immediate benefits from extra production by households receiving subsidy coupons. However the amount of subsidy received by most people was too small to help them *advance* their livelihoods - or (In the terminology of livelihood dynamics)FISP helps them *hang in*, but not *step up* or *step out*. The people who are recognised as benefiting in a more dynamic way are the less poor or better off who are able to use their influence or resources to access more subsidised inputs, which then allow a greater increase in income wealth to allow further investment to *step up* or *step out*.

Views on the wider impacts of FISP reflect this understanding of the primary benefit of FISP in being its food security and *hanging in* benefits. However there is widespread concern that this is being undermined by the rapid population growth that Malawi is experiencing. The implications of this for national food security are discussed later in section 10.2.

In an interesting parallel with the discussion above in section 8.2 on maize exports, the male FGD group in Mangochi commented that with regard to better off people who managed to get ahead by illegally getting more subsidised inputs, group participants were particularly concerned by the way that these better of subsidy recipients then sold the maize outside the area, depriving the local community of greater availability of the much needed commodity. They complained *'zikutipwete kachifukwa akakololanso amakagulitsa zokolorazo kutalio satimmudzi mommuno'*:what bothers them is the fact that the produce is being shipped out of the community.

Another matter of wider concern raised by some FGDs and also raised in previous studies is the negative impact that the programme has brought in some areas on community relations, that is relations both among community members and between them and their leaders.

FGD with women in Phalombe mentioned the fact that they have new knowledge on how to cultivate maize using fertilizer because of the subsidy program.

There was consensus among men and women FGDs in Machinga and Nkhotakota (men FGD) that cases of malnutrition among children have declined especially because of the inclusion of legumes (groundnuts) which they process into flour for porridge.

9 Macroeconomic impacts

The FISP continues to account for a significant share of the fiscal budget. In the 2012/13 budget funding to the FISP constituted 10% of the total fiscal budget and 60% of the Ministry of Agriculture budget (Government of Malawi, 2012) . This has fallen to 9% of the total fiscal budget and 47% of the Ministry of Agricultural budget in 2013/14 fiscal year (Government of Malawi, 2013). Table 9.5 presents some macroeconomic indicators between 2007 and 2012. Overall, the macroeconomic environment in 2012 was characterized by macroeconomic instability, partly owing to the devaluation of the Malawi Kwacha which had multiplier effects on other macroeconomic indicators. The agricultural sector grew at 6.7% in 2011, but it contracted by 2.3% in 2012. The reduction in agricultural growth in 2012 was attributed to decline in the production of maize and tobacco(Reserve Bank of Malawi, 2012).

Table 9.1 Macroeconomic performance indicators, 2007 – 2012 (%)

Indicator	2007	2008	2009	2010	2011	2012
Real Agricultural Growth	12.3	11.8	10.4	6.6	6.7	-2.3
Real GDP Growth	9.5	8.6	8.9	9.5	3.8	1.8
Inflation	7.9	8.7	8.4	7.4	8.8	21.3
Deficit/GDP Ratio (after grants)	-1.6	-7.8	-8.2	4.0	-7.5	-6.5
Debt/GDP ratio	8.2	17.4	16.4	16.3	15.9	28.9

Source: Reserve Bank of Malawi, *Monthly Economic* Review*, April* 2013

The deteriorating performance of the agricultural sector is reflected in the decline in the growth rate of real domestic product from 3.8% in 2011 down to 1.8% in 2012. The economy also witnessed high price instability following a period of reported single digit inflation, with general prices rising by 21.3% in 2012 compared to 8.8% reported in 2011. The fiscal balance deteriorated from a surplus of 4% of gross domestic product to deficits of -7.5% in 2011 and -6.5% in 2012. Government borrowing also worsened to unsustainable levels from 15.9% in 2011 to 28.9% in 2012. The macroeconomic indicators in 2012 suggest that the FISP was implemented under harsh economic conditions compared to the previous years.

The extent to which the FISP has contributed to the macroeconomic instability is not clear, although evidently exchange rate reforms have been associated with high inflation. The programme makes heavy demands on the budget, with total expenditure of US$144 million or just under MK53 billion (see section 4.5 and Annex A1) at the expense of other sectors and activities, and, due to its large share of the budget, contributed to the deficits outlined above. The payment of over MK40 billion of foreign exchange for fertilisers also put pressure on the countries' foreign exchange reserves and on the value of the Malawi Kwacha. However this must be set against the possible need for spending of budgetary resources and foreign exchange on maize imports in the absence of FISP (discussed later in section 10.2), earning of foreign exchange from exports (despite the problems of maize exports discussed earlier in section 8.2) and direct donor support of MK6.4 billion, and the wider benefits to the country discussed in section 8. Nonetheless, the scale of resources allocated to FISP in the context of these economic difficulties has generated public debate, rightly or wrongly, about the sustainability of the farm input subsidy programme. It is clear that efficient implementation of the programme has implications for the macroeconomy and is also affected by macroeconomic conditions.

10 Benefit cost analysis

In this section of the report we present estimates of the benefit cost ratio for the 2012/13 FISP and in this context also examine the contributions of the programme to national food security.

10.1 Benefit cost analysis

Benefit cost analysis, looking at both the overall returns to the programme in terms of its wider economic social costs and benefits and at the returns to government investment, has two main functions:

a) it should allow comparison of returns to investment across different investment alternatives, and

b) it should provide information on features of the programme which are particularly critical to programme returns and which therefore need particular attention in programme design and implementation.

Dorward and Chirwa (2011)and Chirwa and Dorward (2013a)review some of the challenges in applying benefit cost analysis to the FISP. These include difficulties in determining appropriate maize prices and estimates of incremental production, difficulties in estimating and allowing for the indirect impacts of the programme, and difficulties in establishing meaningful comparisons between returns to the FISP and other types of programme where different analytical methods and assumptions are used in estimating benefits and costs. The method adopted here builds on that developed and outlined in Dorward and Chirwa (2011), but utilises insights and new information presented in earlier sections of this report, together with specific information on the implementation, achievements and outcomes of the 2012/13 programme[24]. In particular it draws on

- Information on input disbursements and costs presented in section 4;
- Information on coupon receipts presented in section 6;
- Information on direct programme impacts in section 7, with new estimates of fertiliser responses, of incremental maize and legume production, and of on farm costs and returns with subsidised inputs;

[24] As in Dorward and Chirwa (2011) and Chirwa and Dorward (2013a) this separates out consumer and producer benefits (through estimates of consumer and producer surpluses) but 'without subsidy' prices are estimated using import parity prices estimated from SAFEX forward prices with a transport mark up in recognition of the changed regional maize market situation described in section 8.3.2.

- Insights from the LEWIE modelling in section 8 as regards the application of economy wide multipliers;
- The discussion - in section 8 of the changing relationship of Malawi domestic maize prices with international and regional prices
- Household survey information on cropping patterns and input use not explicitly presented in the report

Table 10.1 summarises the estimated economic costs and benefits of the programme. Costs are divided between programme costs and incremental farmer costs. Incremental production is taken from section 8, using the 'middle of the range' estimates. Farmer costs are based on the figures provided in Annex 2. Multipliers are applied as set out in Dorward and Chirwa (2011), with a multiplier of 1.4 applied to the estimated incremental consumer surplus, 1.3 applied to the incremental producer surplus, and 1.2 applied to non-rural costs. The estimated returns are similar to those estimated in recent years (Chirwa and Dorward, 2013a; Dorward and Chirwa, 2012a), NUE(N) and hybrid maize benefits are a little higher as discussed in section 7, as are maize prices (with high 'with subsidy' estimated domestic prices and the use of a SAFEX forward price, with a $100/MT transport mark-up, to give an import parity price of US$330/MT in the no-subsidy situation). The displacement and leakage figure (30%) is a little higher than in previous years, but this does not affect the BCR much, and has more impact on the NPV and Fiscal Efficiency (FE). The use of multipliers boosts estimated returns, but evidence presented from the LEWIE model in section 8 supports already strong arguments for their use(Chirwa and Dorward, 2013a; Dorward and Chirwa, 2011).

Table 10.1 Estimated programme benefits, costs and returns (US$ million)

	Before displace-ment& leakage	*After displace-ment& leakage*	*With multipliers*	
Incremental maize production (MT)	1,071,288	722,574	722,574	
Producer surplus, maize	349.69	234.62	305.00	*(1.3)*
Consumer surplus, maize	3.27	3.45	4.83	*(1.4)*
Producer net gain legumes	22.87	22.87	29.73	*(1.3)*
Total Producer & Consumer gains	375.83	260.94	339.56	
Programme Cost summary				
Fertilisers	123.23	86.26		
less farmer contribution	(4.22)	(2.95)		
Hybrid seed	8.34	4.17		
OPV seed	2.33	1.16		
Legume seed	4.89	4.89		
Other programme costs	9.03	9.03		
Total programme costs	143.59	102.56	123.07	*(1.2)*
Farmer Cost summary				
OPV seed purchase payments		-		
Hybrid seed purchase payments	0.33	0.16		
Fertiliser purchase payments	4.22	2.95		
Fertiliser transport costs	5.06	3.54		
Fertiliser procurement costs	2.11	1.48		
Fertiliser application labour	5.06	3.54		
Extra harvest labour	58.71	39.60		
Total farmer costs	75.48	51.27	66.66	(1.3)
TOTAL COSTS	219.07	153.83	189.73	
Benefit Cost Ratio (BCR)	1.72	1.70	1.79	
Net Present Value (NPV)	156.75	107.10	149.84	
Fiscal Efficiency (FE)	1.09	0.75	1.04	

These estimates suggest good economic benefits of FISP. However, as noted earlier, benefit cost analysis can also provide valuable information on issues that are critical for the achievement of high economic returns and should therefore be of interest in programme design and implementation. Figure 10.1 therefore shows the effects on programme returns from variation in five different variables and hence both show the sensitivity of estimates to the parameter estimates used and suggest ways in which the benefits, effectiveness and efficiency of FISP could be substantially improved.

In the upper left panel we plot against the right hand axis the effects of rising fertiliser prices on BCR and Fiscal Efficiency (or FE, the ratio of NPV to fiscal costs), and on the left the effects on NPV and programme costs. As would be expected, fertiliser prices have a major impact on all these measures of programme performance, with a doubling of price leading to a 70 to 80% increase in total costs, and substantial falls in fiscal efficiency (or economic returns to budgetary expenditure), in NPV, and in BCR.

Turning to the upper right panel, high levels of displacement do not appear to reduce the BCR, but this is misleading as the calculation of the BCR ignores the costs of fertiliser that is displacing existing commercial purchases, treating it as a social transfer. However the falling NPV is being generated by a constant level of government expenditure, and the result is falling fiscal efficiency and reduced effectiveness of government expenditure in delivering social benefits. Reducing displacement and leakage for example through improved control and better targeting would therefore lead to significant improvements in programme effectiveness and efficiency.

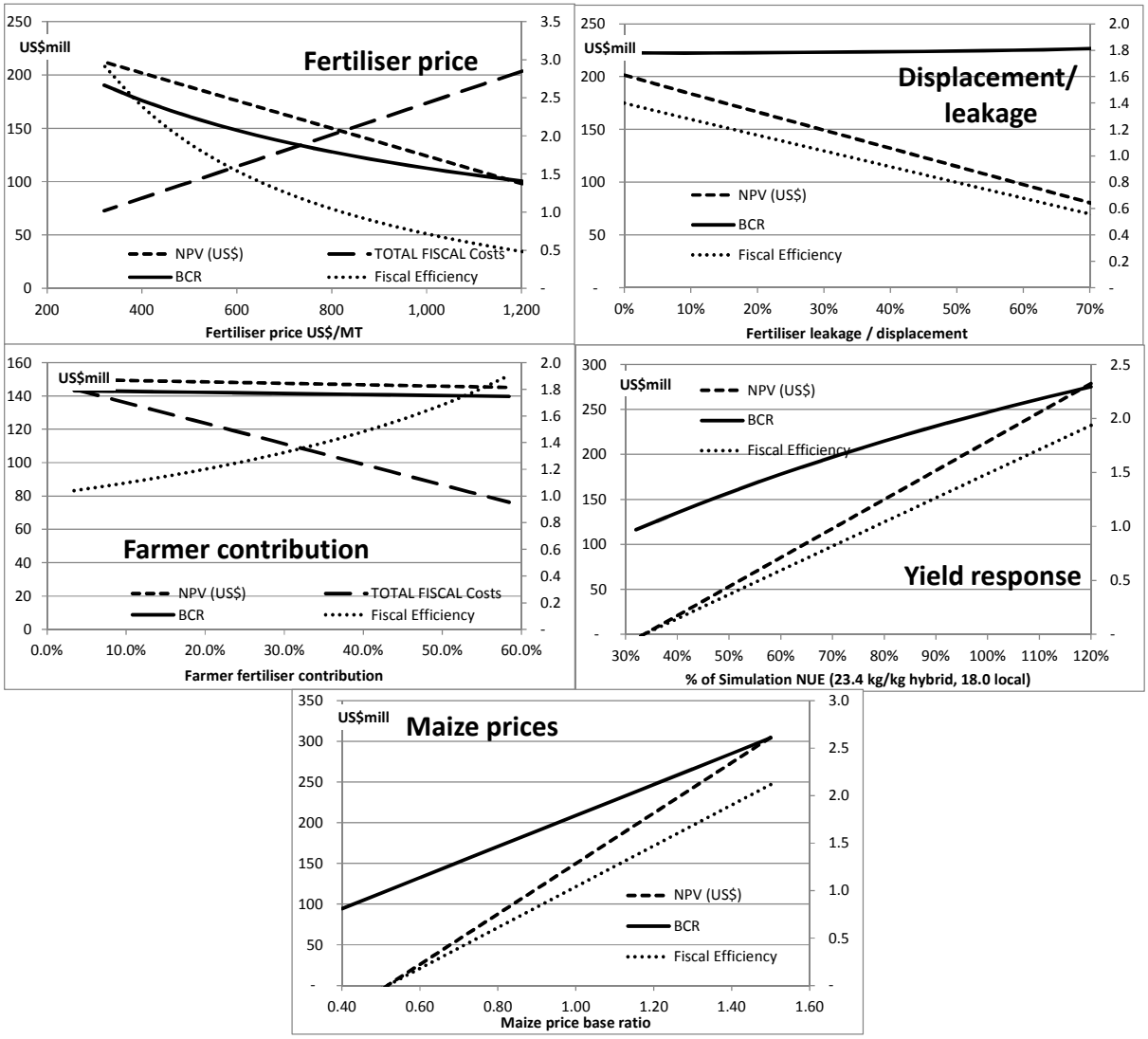

Figure 10.1 Effects of parameters on estimated economic benefits and returns from FISP

Notes: Maize prices as a ratio of prices used in estimates in table 10.1.

In the lower left panel the effects of increasing farmer contributions are examined. Assuming that it does not significantly affect farmer uptake and displacement or leakage, raising farmer contributions has little impact on the NPV or BCR, but it leads to falling programme costs and a dramatic increase in fiscal efficiency. However Holden and Lunduka (2013) estimate that a drop in subsidy in 2009/10 from 90% to 70% would have led to a fall in the proportion of households willing to purchase subsidised fertiliser from approximately 85% to 70%.As noted earlier, raising farmer contributions may also reduce the value of the coupons and of subsidised inputs, and thus reduce criminal interest in and opportunities for corrupt acquisition of coupons.

The lower right panel of figure 10.1 shows the effects of changes in yield response to subsidised inputs with steady falls in FE, NPV and BCR. Increasing yields, of course, substantially improves programme achievements. Finally, the bottom panel shows the sensitivity of estimated returns to the programme to changing maize prices[25].

10.2 National food security

The FISP medium term plans sets out the objectives of the FISP as being to 'increase food security at household level through agricultural output growth' by increasing agricultural productivity and input market development. Various sections of this report have examined achievements of different aspects of goals and purposes of FISP, including incremental production, domestic maize markets, and household food security. The consideration of production impacts and domestic maize markets are particularly relevant to FISP's contribution to national food security, but we have left explicit examination of national food security to the end of the report, after consideration of the overall economic analysis of the programme: discussion of food security contributions needs to be fully informed by prior discussion of these other issues, and is also relevant to the discussion of the programme's economic contribution.

The Malawi Government faces three broad options in attempting to promote national food security:

- reliance on imports by the private sector,
- maize importation by government itself, and
- promotion of increased maize production for domestic consumption.

As regards imports, a distinction may also be made between small scale importation to meet relatively small shortfalls in Malawi's maize balance, and large scale imports to meet large deficits due to major production shortfalls. The former (small scale imports) have been common in the past, with a large volume of informal private sector imports (as shown earlier in figure 8.5), particularly into the southern region from Mozambique. However even with increased volumes supplemented by imports from Tanzania and Zambia these were not sufficient to prevent drastic maize price spikes in years following major production shortfalls, such as the 2001/2 and 2005/6 marketing years. In such seasons much larger scale formal imports are needed from further afield than Malawi's immediate neighbours. However as mentioned in the discussion of maize markets in section 8, there are systemic difficulties in government and private sector coordination in such large scale importation. While improved coordination between government and private sector importers, and increased roles of private importers, should be a long term policy goal, questions remain about how this should be achieved in the short term. There are also new challenges from two major changes affecting domestic supply and demand, changes that have not to our knowledge been properly considered in formal reports on and discussions about the impacts of the FISP. These are first the effects of rapid population growth on domestic consumption demand and second (as discussed earlier in section 8) emerging regional deficits of maize and the implications that this has for maize supplies and prices in Malawi.

Figure 10.2 sets out estimated national production, consumption needs and deficits and surpluses from the 2001/2 marketing season to 2013/14. Consumption needs are estimated by multiplying the annual population by 193 kg maize per person, with population figures taken from the 2008 census reports and population projections. Production estimates are from annual MoAFS crop estimates for maize, but these have been adjusted downwards by 10% from the 2007/8 marketing season (2006/7 production season) onwards to provide some allowance for likely over-estimates of production (as suggested by comparison of these estimates, discussed for example by Chirwa and Dorward (2013a).

[25] This shows the effects of identical proportional increases in with and without subsidy prices. Increases in 'without subsidy' prices raise both producer and consumer benefits from the subsidy, whereas increases in 'with subsidy' prices raise producer benefits but reduce consumer benefits.

The domestic surplus or deficit is then calculated as the difference between production and consumption. There appears to be a clear division of the graph into two periods, before and after the beginning of the FISP (or AISP as it was initially called). Prior to the introduction of the FISP (or AISP) in 2005, estimated production was below estimated consumption with an annual deficit which in 2001/2 and 2005/6 were of crisis proportions. This was despite implementation of the smaller scale TIPS subsidy programme in these years (surpluses were estimated in the 1999/200 and 2000/2001 marketing years, following seasons when the larger Starter Pack programme boosted production). From the 2006/7 marketing year, however, the situation appears to have changed, and apart from a very small deficit in the 2008/9 marketing year there are no years with estimated deficits. This pattern is supported by export and import figures presented earlier in figure 8.5. It suggests that FISP may have played an important role in reducing the need for imports. This can be investigated by trying to estimate what production and surpluses or deficits there might have been in the absence of FISP. Figure 10.3 presents such an estimation, with production represented by MoAFS estimates (adjusted as above) for each subsidy year less estimates of incremental subsidy production from previous evaluation studies.

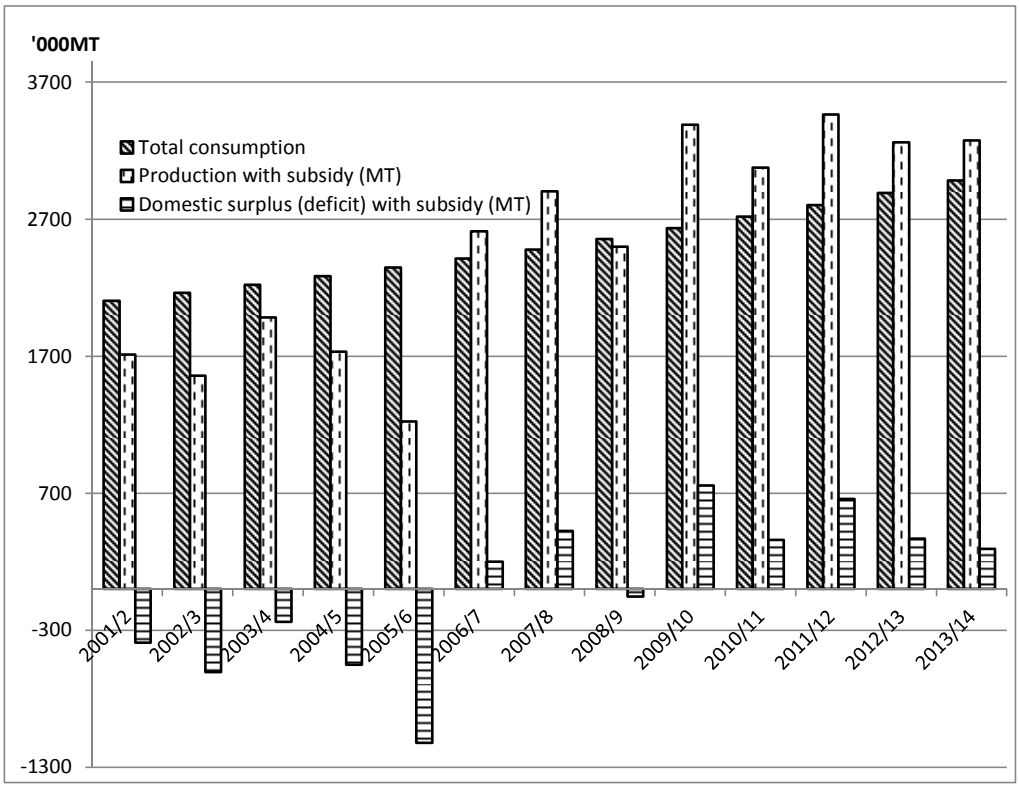

Figure 10.2 Estimated consumption, production and surplus/deficit by marketing year
Sources: (National Statistics Office, 2008, 2009), MoAFS Crop Estimates.

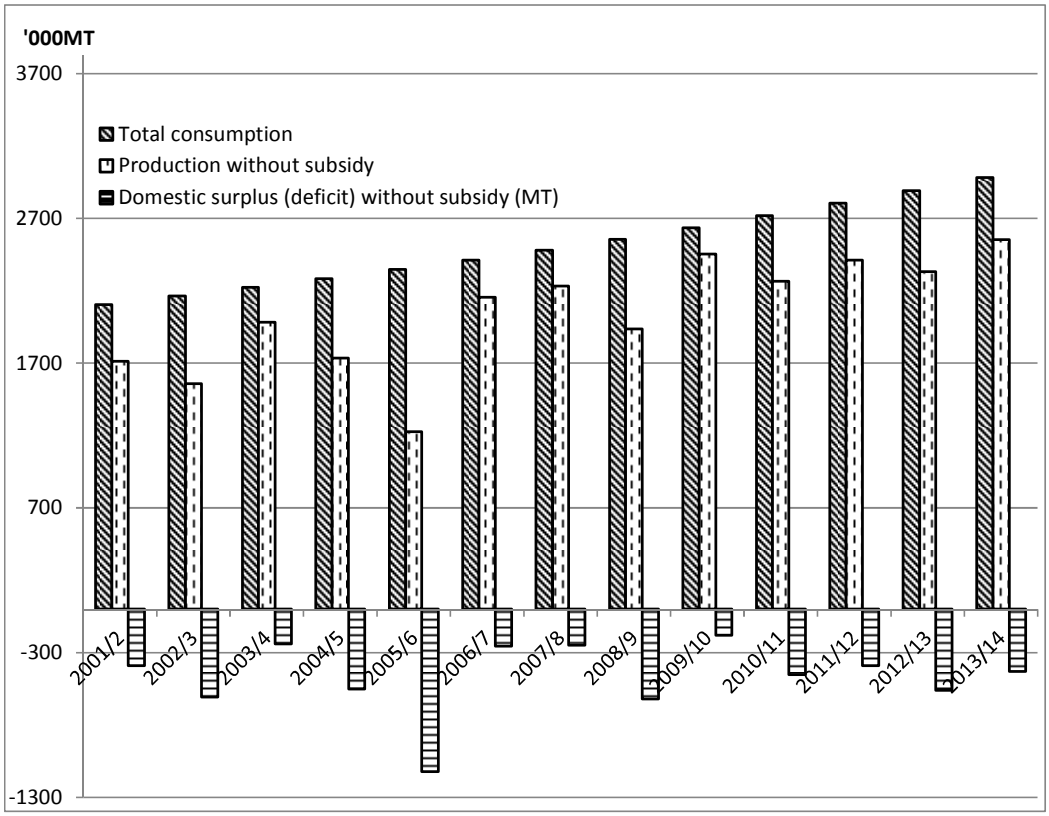

Figure 10.3 Estimated consumption, production and surplus/deficit in the absence of subsidies by marketing year

Sources: (National Statistics Office, 2008, 2009), MoAFS Crop Estimates, Evaluation studies.

There is considerable uncertainty about the accuracy of these figures, but the general picture is clear – the estimated surpluses for the FISP years are wiped out in the 'no FISP' scenarios in figure 10.3 and replaced by deficits: the programme is estimated to have saved an average of around 385,000 MT of imports per year over its life and around 430,000 MT of imports in 2013/14. Given the concerns that the high maize prices in recent years may suggest MoAFS over-estimates of production in recent years, even with a 10% reduction allowed for figure 10.3 is more likely to under-estimate rather than over-estimate the extent to which deficits rather than surpluses would have been experienced without FISP. Put at it most simple, we may ask how maize production could have changed without FISP, to turn persistent pre-FISP deficits into surpluses while consumption demands are increasing with population growth of around 3% per year - giving (at constant per capita consumption) an increase in national demand of nearly 17% every five years and of 28% from 2005/6 to 2013/14.

This analysis suggests that the FISP has played a substantial role in promoting national food security in the past. The value of saved imports from the 2007/8 to 2013/14 market seasons is estimated at between 85% and 110% of FISP programme costs depending on the use of domestic or SAFEX import prices for valuing maize imports. This analysis does not allow on the one hand for (subsidised) sales income from imported maize sales or on the other for the benefits of households having more local access to maize, the dangers of reliance on often late imports, or the long term social, economic and health costs of periods of widespread food shortages and high prices. It also ignores the wider economic benefits from FISP discussed in section 8. However it must also be recognised that the emergence of a seasonal regional export market poses challenges to FISPs continued role in supporting national food security, if a large part of the surpluses it generates are exported. This, however, is a threat to national food security in either the presence or absence of FISP.

11 Summary and conclusions

11.1 Evaluation methods

This report aims to provide policy makers, technical staff and other interested stakeholders with information and analysis that will assist them to determine the overall value for money of investments in the FISP; its contributions to agricultural production, food security, and farmers' and consumers' welfare; and areas where design and implementation of the programme may be improved. The report uses information from a variety of sources, principally data on programme implementation from the Logistics Unit, a survey of input suppliers carried out in 12 districts in early 2013, a nationally representative household survey including 2,000 households in 13 districts in May 2013, supported by a 'Community Survey' in 100 sampled enumeration areas and Focus Group Discussions with male and female groups in sampled districts. A further sample survey of 120 households in Lilongwe and Zomba districts was carried out from December 2012 to June 2013 to gather more information about cropping patterns and practices, yields and labour use. Data from the NSO 2010/11 Integrated Household Survey (IHS3) was analysed to gain information on maize cropping practices and yields and on FISP coupon access and use in the 2008/9 and 2009/10 seasons. Information was also made available to the team from nationwide on-farm trials investigating maize yields with different legume inter-crops and rates of inorganic fertiliser.

Data from these different sources was brought together with information from maize crop simulation modelling (to examine smallholder maize yield responses to fertiliser use with local and hybrid seeds) and with the development of a model using an innovative Local Economy Wide Modelling Impact Evaluation (LEWIE) approach to examine the indirect benefits of the programme. In addition specific information was gathered from a variety of sources on domestic and regional maize prices in order to analyse recent structural market changes and their implications for Malawi and specifically for the effectiveness of the FISP in improving national food security and contributing to inclusive growth.

11.2 Programme implementation and costs

Drawing largely on data from the Logistics Unit weekly and annual reports, section 4 of the report presents a detailed analysis of programme implementation activities, achievements and costs.

Given the size of the programme, implementation involves complex coordination of activities and stakeholders in order to meet critical seasonal deadlines aimed at maximizing the programme benefits. The 2012/13 FISP reached out to 1.5 million smallholder farm households out of 4.4 million registered farm households in rural Malawi. It involved distribution of more than 6 million coupons, over 3 million bags of fertilizers and nearly 3 million bags of seeds across the country whose road infrastructure poses a lot of challenges to reach to remote areas.

As in previous seasons, the private sector was mainly responsible for the procurement of fertilizers to the programme through the tendering process, but did not participate in retail sales of subsidized fertilizers to farmers. Different from previous seasons, the tendering and procurement were initiated earlier in the 2012/13 season, but the initial call was cancelled leading to subsequent delays resulting in tender awards in September. The delays in some ways resulted in large spreads in prices and some very high prices for fertilizers, some of which were also delivered in late November or December. The delays in tendering led to delays in the delivery of fertilizers to depots, although they seem to have helped averting storage problems experienced in previous years. It should be noted, however, that the fundamental storage and transport constraints evident in previous years have not gone away, and solutions involving for example much earlier delivery, distribution and redemption, and the involvement of the private sector in these processes need to be considered. Nonetheless,

uplifts to unit markets were similar to previous seasons but limited uplifts by the end of October are a matter of concern for early planting and fertiliser application.

A new issue that arose in 2012/13, or at least arose at a much greater scale than in the previous seasons, concerns the theft of fertiliser during transport from depots to markets. This needs to be addressed through improved vetting of transporters prior to the award of transport contracts, and through better procedures for monitoring stock from the depots through transport to market sale. The ESOKO pilot shows promise but also highlights issues that need to be addressed regarding staff and management commitment and mobile phone coverage and use.

The delays in payment of invoices from fertilizer and seed suppliers constitute a significant risk for the private sector, with the potential to influence future pricing of tenders especially when government builds a reputation of inefficiency in payment systems. Given the very large proportion of programme costs accounted for by fertiliser procurement, any improvements in tendering and other payment processes that can reduce fertiliser prices have the potential to significantly reduce overall programme costs.

As for the last four years, the programme is to be commended for its adherence to budgeted costs. As noted above, however, there should be opportunities for reducing costs of fertiliser with more streamlined and tighter tendering. In addition, the cost of the programme can also be reduced by raising farmer contributions (reducing the value of the subsidy). While the prices of fertilizers have risen over time, the farmer contribution has remained the same in nominal terms and as a proportion of the cost of delivered fertiliser it has fallen from 35% in 2005/6 to 3% in 2012/13. With the falling value of the Malawi Kwacha, holding the farmer contribution constant increases fertiliser costs for government and hence overall programme costs. Raising farmer contributions may also reduce benefits and hence incentives for criminal activity around the theft of coupons but will make it more difficult for the poorest beneficiaries to redeem their coupons.

Issues regarding the targeting of beneficiaries, access to coupons, redemption processes and farmer choice in seed types and varieties are critical for achieving programme objectives. We note, however, continued achievements in promoting access to legume seed, but also constraints on the supply of some seeds.

11.3 Input supply systems and the private sector

Section 5 of the report presents an analysis of information collected from a survey of input suppliers in early 2013, linking this, where appropriate, to information about programme implementation from section 4.

The input supply system comprises distributors/importers, ADMARC/SFFRFM, independent Agro-Dealers and other wholesale shops and cooperatives. The sector is fragmented into all season operators, seasonal operators and intermittent operators accounting for 38%, 57% and 6%, respectively. The seasonal suppliers target rain-fed cultivation, and most of the agro-dealers fall in this category. Most distributors/importers operate throughout the year and on average create 4.7 paid jobs per outlet while agro-dealers create 1.7 paid jobs per outlet. The average number of months that suppliers operate their businesses is 6.8 months. Distributors and agro-dealers sell a diversified range of goods in addition to agricultural inputs, including sale of maize, groceries and building materials, all of which are important in the rural economy.

Independent agro-dealers play important roles in making seeds of different kinds accessible to farmers, but play a much lower role in the fertiliser market, their exclusion from the retail of fertilizers under the subsidy programme being a major cause of this. ADMARC and SFFRFM tend to specialize in fertilizers and fewer outlets reported having maize seed stocks in 2012/13. While the bulk of seeds sales were for maize, the availability of legume seeds remained problematic and highly variable among the suppliers.

Most of the fertilizer stocks carried forward from 2011/12 and acquisitions in 2012/13 were sold within the season across all the types of the suppliers. Nonetheless, on average, 29 tonnes remained at the end of the season among distributor/importer outlets compared with only 2.8 tonnes in ADMARC/SFFRFM. Most of the seed sales were under the subsidy programme, with very few suppliers indicating that their customers were also buying commercial seeds at the same time as they were redeeming the seed coupons.

Hybrid maize seeds were the most stocked seeds among suppliers and also tended to be the most sold seeds under the subsidy programme, with 81% of hybrids sold using coupons compared to 92% of OPV maize seeds and more than 97.5% of legume seeds. The most popular hybrid varieties were SC 403, DKC 8053, MH26 and PAN 53, with SC403 being the most wanted variety by farmers. ZM 623 and ZM 621were the most popular OPV variety with farmers and ZM623 turned out to be the most wanted variety by farmers.

The seed market remains highly concentrated in terms of varieties and seed producers. For instance, 82% of seed for the most popular OPV varieties came from two seed producers and 77% of seed for most popular hybrid varieties came from two firms. The market concentration levels are high, such a structure offers limited choice to farmers and may not result in competitive seed pricing. There is also high concentration of suppliers in the upstream market, although there had been a marginal increase in the number of competitors at local level.

There was a general problem of stock outs of preferred seeds and fertilisers, and long queues across supplier type. The majority of suppliers (more than 75%) reported some days without stocks of preferred seeds and at least 49% reported some days with long queues of farmers, independent of supplier type.

The subsidy programme appears to have both promotional and displacement effects. Most suppliers attributed any business contraction to the subsidy programme. There were mixed ratings of the seed and fertilizer subsidy system among the suppliers, with the private sector being more positive about the seed system but being more negative about the fertilizer subsidy system. However, there has been some growth in number of outlets, particularly among distributors/importers and agro-dealers with 43% and 40% indicating expansion, respectively. More agro-dealers (41%) reported increase than decreases (38%) in the sale of commercial fertilizers in the past 5 seasons compared to 38% of distributors experiencing an increase and 56% a decrease in commercial sales of fertilizers.

Although some of the suppliers attributed the contraction of their input business to the subsidy programme, most of suppliers' comments were on improvements to the current system, including increasing the number of beneficiaries for seeds, increasing the number of beneficiaries for fertilizers (more from respondents at parastatal outlets but less so from private sector respondents), earlier implementation of the programme, and allowing the private sector to retail subsidized fertilizers (the dominant view among the private sector respondents).

11.4 Access to and use of coupons and inputs

Information on farm household's access to and use of coupons and inputs is derived largely from a nationally representative household survey conducted in May/June 2013, and an analysis of this information is presented in section 6 of the report. This is supplemented where appropriate with information from Logistics Unit reports (as presented in section 4) and from focus group discussions with rural people and a 'community survey' with local leaders in 13 districts. Findings are compared with the findings of previous reports.

The coupon allocation and distribution systems have not changed much in the past few seasons. At programme level, in 2008/9 one innovation was the use of open meetings during the registration and distribution of coupons. In the 2012/13 season, another innovation was to make available the list of beneficiaries within the communities in order to improve transparency and accountability. The lists of beneficiaries were expected to be publicly available. Other innovations at a local level are

more focussed on coupon redemption processes and include establishment or market committees and organisation of redemption by villages on specific days.

Although the proportion of rural households receiving coupons has risen over time, the number of coupons received per household declined in 2012/13 compared to the previous seasons, suggesting increasing sharing of coupons particularly in the southern and central regions of Malawi. The average number of coupons received by households in the northern region has remained fairly stable averaging above 1.5 compared to averages below 1.5 and nearly 1 in the central and southern regions respectively.

Survey estimates of total coupon receipts derived from national population data collected by NSO suggest that a significant number of coupons did not reach rural households, with 37% of fertilizer coupons, 32% of maize seed coupons and 48% of legume seed coupons 'unaccounted for' in comparisons of total coupons supplied and estimated household receipts. These estimates are similar to those obtained in previous surveys. If farm families registration data collected by the Ministry of Agriculture are used, for which there are more incentives for households to split, the estimate of coupons reaching rural households is greater than the number of issued coupons. It is important that reasons for discrepancies between the numbers of farm families and rural households be resolved in order to demonstrate the probity of the programme and/or identify and eliminate theft and leakages of coupons, garner policy and public support for the programme, and ensure that policy decision and programme designs are based on a reliable understanding of the number and nature of smallholder farmers.

Targeting of coupons remains a critical issue in the implementation of the FISP. As has been the case in previous studies an increasing proportion of households that receive coupons receive 1 or less coupons and this is particularly the case in the south and the centre. Nationally, survey estimates suggest that 40% of the rural population did not receive coupons, 41% received 1 or less coupons and only 18% received more than 1 coupon in the 2012/13 season. In addition, although all categories of households are likely to receive coupons, poor and vulnerable households, young households and female headed households tend to receive less. The analysis also suggests that the redistribution of coupons that take place in the communities occurs among poor households while better-off beneficiary households tend to keep their two coupons.

Although the beneficiary list has more female headed households, the survey results suggest that male headed households are dominant recipients but the gender imbalance of recipients is less pronounced, suggesting that in a substantial proportion of male headed households female members were the recipients of coupons.

While open meetings are widely used in allocation and distribution of coupons, the results from the survey suggests that most such meetings do not empower communities to make decisions in the allocation and distribution of coupons. Instead the open meetings are widely used to inform the communities of coupon allocation decisions already made by the village head or traditional authority. This suggests that the targeting of beneficiaries is prone to biases that are inconsistent with the targeting criteria. Similarly, while 30% of the respondent households were aware of the availability of the beneficiary list at mainly the village head's house, only 10% of these reported that a member of the household had actually seen the list of beneficiaries, and most of these had seen the name of a household member on the list.

In terms of the confidence in the coupon allocation and distribution systems in 2012/13 compared with the previous years, the perceptions are that the number of coupons is declining relative to the number of potential beneficiaries, there is indifference regarding changes in the coupon distribution methods, and there is a decrease in the rating of the timing of coupon distribution. Targeting the poor with 100 kg of fertilizers or targeting all households with 50 kg of fertilizers are preferred and ranked the same, with the ranking improving over the 2010/11 figures. With increasing sharing of

coupons already taking place, providing 50 kg of fertilizers to all rural households is seen by many as a fair system.

As reported in previous studies, approximately 1% of respondents reported that fertilizer coupons were obtained after paying some money, mainly to traditional leaders, agricultural staff members and traders. However sensitivities in getting such information mean this is likely to be an under-estimate. Such payments varied considerably, but on average MK600 was paid per coupon. As reported in previous studies, most of the coupons were used to purchase fertilizers, with very few coupons (5% of fertilizers, 2% of maize seeds and 6% of legume seed) being sold or not used by the farmers. One of the reasons for not using the coupons was lack of inputs at stockists, as also reported from the input supplier survey.

Some redemption of coupons required farmers to 'pay tips' for redemption of fertilizer coupon above the official price of MK500 per bag and such extra payments were in the region of MK30 – MK4,500 with a median of MK1050. The incidence of such extra payments was lower in the northern region than in the central and southern regions.

Hybrid maize seeds tend to dominate on the types of maize seeds obtained with a coupon, accounting for 87% of the reported redemptions with the remainder being OPV maize seeds. With regard to legumes, groundnuts had the highest proportion redeemed and cow peas and pigeon peas had the lowest redemption rate. Some of these redemption outcomes may be determined by the availability of the types of seeds at the retail supplier rather than by farmer choice, with the supplier survey also showing variations in the stock levels for hybrid maize seeds (dominant) and limited stocks of legume seeds. However, most farmers got the type of inputs they wanted, except that about 27% who wanted hybrid maize seeds were forced to opt for OPV maize seeds. Two maize seed types dominated redemption, SC403 and SC627 produced by one company, accounting for 57% of the market share although these also tended to be the most preferred varieties among 63% of the farmers. The dominant structure of the seed system is also reflected in the seed stocks carried by various input suppliers. It is not known whether this is a result of farmers' choice or the aggressive marketing strategies of the seed producer.

Beneficiaries face a variety of problems in the redemption of vouchers and these problems are more pronounced with respect to fertilizer vouchers. The most reported problems in fertilizer voucher redemption at ADMARC or SFFRFM outlets are long queues (reported by 47% of beneficiaries) and queue jumping (40%), long distances and vendors (30% each), input shortages and slow service (30% each). Demands for 'tips', abusive language, and gender-based violence were reported more among ADMARC outlets (22%, 11% and 8% respectively) than among SFFRFM outlets (8%, 3% and 0%, respectively). With respect to maize seed voucher redemption, the problems were more pronounced among ADMARC/SFFRFM outlets than private sector outlets (long queues for example being reported respectively by 31% and 11% of beneficiaries).

Most of the inputs (97% of fertilizers, 96% of hybrid maize, and 89% of OPV seeds) procured using coupons were used on beneficiaries own gardens, with only 1% of subsidized fertilizers sold. All of the fertilizers were reported to have been used on maize gardens.

There is increasing evidence that the current extension system is not reaching out to the farmers and this has the potential to undermine the benefits of the programme. Extension services are one of the complementary programmes that can enhance the production impacts of the FISP. The results suggest that only 11% of the farmers in 2012/13 compared to 14% in 2006/07 and 13% in 2010/11 received advice from field assistants. The low reported access to advice and apparent deterioration of access to technical advice over time calls for a serious review of the suitability of the demand-driven extension system in the smallholder farmer agricultural system in Malawi.

There appears to be limited demand for other (non-maize) inputs to be provided under subsidy.

11.5 Direct impact of the FISP

FISP generates benefits to beneficiaries and more widely through increased production of maize and legumes as a result of increased use of subsidised certified seeds and inorganic fertiliser inputs. Estimation of the productivity of these inputs on Malawi's smallholder farms is critical for the estimation of the impacts of the FISP, but previous evaluation and other studies have failed to deliver reliable information on this critical issue.

Analysis of IHS3 survey data on crop management and yields suggests that it is not possible to use crop survey data to obtain reliable and unbiased estimates of yield responses to inorganic fertiliser and the use of improved seeds. It also explains the inconsistency in different studies' estimates of these yield responses. An alternative approach for investigating smallholder maize yield responses was developed, using physiological crop yield simulation models. A model was developed and calibrated to describe the growth of hybrid and local maize on four Malawian soils with different management practices, and yields were then simulated for different rainfall conditions (derived from long term rainfall records) and different smallholder management practices (derived from 2012/13 household survey data). The results were used to estimate a regression model linking yields to management practices. This model was then linked to 2012/13 household survey data to allow estimation of the incremental production impacts of incremental smallholder subsidy use.

The Nutrient Utilisation Efficiencies (NUEs) estimated in this way are a little higher than those used in the past. Some upward bias in estimates is expected (as a result of patchy rainfall, soil variability, and pests and diseases on smallholder farms). Once some allowance is made for this, estimated NUEs for subsidised fertiliser use under average management conditions on plots without any other fertiliser applications are approximately 19 and 14.4 kg grain per kg N for hybrid and local maize varieties respectively. These are supplemented by NUEs for phosphate application of approximately 1.1 and 3.3 kg grain per kg P_2O_5, although phosphate responses vary with soil type. A switch from local to hybrid maize is estimated to yield 18 kg of grain yield per kg of seed irrespective of further gains from fertiliser application. These fertiliser responses are somewhat higher than the rules of thumb used in previous evaluations: NUE(N) of 18 and 12 kg grain per kg N for hybrid and local maize varieties respectively, no extra allowance for responses to P_2O_5, plus 16kg kg of grain yield per kg of hybrid seed. This leads to an estimate of 1.1 million tonnes of incremental maize production from the 2012/13 before displacement of any inputs (that is assuming that all of the subsidised fertiliser and maize seed sales are used by smallholders who would not have bought unsubsidised inputs in the absence of the subsidy). This is considerably higher than estimates of incremental production in previous years. This estimate falls, however, to over 722,000MT if allowance is made for a higher rate of seed and fertiliser displacement and leakage (based on past estimates of seed and fertiliser displacement rates and allowing for higher rates of leakage given discrepancies between official input sales and survey estimates of coupon receipt). Incremental legume production is estimated at a little over 32,000MT, mainly groundnuts.

Analysis of the maize crop yield simulation model results also reiterates the importance of timely planting of maize, timely weeding, and high plant populations for raising yield responses and hence returns to the use of subsidised fertiliser. This means that there is potential for substantial increases in incremental production and in the programme benefits if coupon and fertiliser distribution and input sales can be completed before the start of the planting season, and also suggests an important extension role in helping farmers to get more out of their inputs.

Estimates of net direct incremental benefits to beneficiaries from subsidised fertiliser and maize seed inputs are estimated to be between MK50,000 and MK70,000 per subsidy pack depending upon maize prices, or around 500 kg of incremental maize, if all input use is incremental. This will of course vary with local soil and rainfall conditions and with plot management (principally time of planting, weeding, and plant density). All calculations take no account of possible post harvest losses.

It has not been possible to investigate possible subsidy impacts on beneficiaries' food security, health or education without analysis of panel data, which is not available.

Important insights on programme impacts were provided from Focus Group Discussions (FGDs) with male and female groups in each district. There are widespread views that the programme helps poor people with problems of food insecurity, indeed plays a critical role in this, but the scale of the programme (both the number of beneficiaries in each locality and the number of coupons received per beneficiary) is not large enough to overcome problems of food insecurity and allow people to advance their livelihoods. This may be characterised as helping people to 'hang in' but not 'step up' or 'step out'. Population growth plays a critical role here as the number of coupons and the amount of inputs disbursed in 2012/13 is roughly the same as in 2005/6, but the population has increased substantially since then (by around 24%). This not only reduces the number of coupons and amount of inputs available per person or household (as recognised by FGD members) but does this in a context where there are increasing pressures on land and other resources.

11.6 Wider, indirect impacts of the FISP

Wider indirect impacts of the FISP should arise as a result of increased supply of maize and consequent lower maize prices, reduced supply of and increased demand for labour and consequent higher wages, and consequent increased incomes and expenditure stimulating growth and diversification in the rural economy. Such processes are very difficult to demonstrate empirically. A novel Local Economy Wide Impact Evaluation (LEWIE) model was constructed using IHS3 data and initial application suggests that there should be substantial wider benefits from the FISP beyond direct production and income benefits, and that these accrue to both beneficiaries and non-beneficiaries. Alternative model simulations also suggest that a large scale subsidy is important for the achievement of these benefits, which would be reduced if the programme were to be scaled down. There is potential for further development of the model to provide more robust and detailed information about the nature and scale of these wider benefits and about the factors that affect them.

We do know, however, that the behaviour of maize markets is critical for these wider benefits, as a major expected benefit of FISP is its promotion of low and stable maize prices relative to incomes of the poor in the medium and long term. However, maize prices have not been stable and have trended upwards and spiked in recent times, both in Malawi Kwacha and US dollar terms. Although the number of buyers has increased and there is better, albeit variable, market information, the changing market structure has not resulted in competitive pricing of maize. In addition, owing to liquidity constraints, ADMARC has increasingly been unable to defend either minimum or maximum prices. The maize price swings in some cases have offered incentives to traders to export some maize as domestic maize prices have fallen below export parity prices, particularly in 2007, 2011 and 2012. Such exports have occurred notwithstanding the existence of export bans on maize, suggesting the need for policy instruments that provide a win-win solution to the private sector and government in ensuring low and more stable prices to maize consumers. This is a major challenge, and some suggestions are made regarding specific policy options.

Labour markets, where FISP again has the potential to drive important indirect benefits for the poor, have also been adversely affected by recent macroeconomic conditions with the devaluation of the Malawi Kwacha and rapid inflation. Household survey Information indicates that real wages (measured against maize prices) fell by around 22% from January 2012 to January 2013. It is not possible to determine if the FISP has played any role mitigating this fall in wages (so that wages would have fallen by more in its absence).

As with the consideration of the direct impacts of FISP, valuable insights on indirect programme impacts were provided from Focus Group Discussions (FGDs). These reiterated the concern that FISP does not appear to be driving any wider livelihood changes: the absence of positive change is very visible, but it is not possible for people to see ways in which it may be providing some protection

against or mitigation of the negative effects of macroeconomic shocks and rapid population growth. There are however concerns that competition for and arguments over access to coupons and inputs leads to tensions within communities and sours relations in various ways. There are also concerns that those who benefit the most are often more powerful and less scrupulous people who do not then share the wider benefits of subsidy receipt (such as increased maize for local sale) within the community.

11.7 Macroeconomic impacts

In the last two years Malawi has faced well known and severe macroeconomic challenges. The FISP makes large demands on scarce government and foreign exchange resources. However it also plays important roles in maize production and national food security, and reduces the need for government expenditure and use of foreign exchange for maize imports which would be needed in its absence. It is not possible to determine the programme's macroeconomic impacts. It is, however, clear that efficient implementation of the FISP is important in for Malawi's macroeconomic situation, and that the FISP is severely affected by adverse macroeconomic conditions and currency devaluation.

11.8 Benefit cost analysis and national food security

Benefit cost analysis has two main functions, investigation of the value of the programme as compared with alternative uses of resources, and identification of features of the programme critical for effective and efficient achievement of its objectives. A Benefit Cost Ratio (BCR) of 1.7 is estimated from direct impacts only, and this rises to 1.8 with (conservative) allowance for wider indirect benefits. Fiscal efficiency (the ratio of net economic benefits to government expenditure) is estimated at 0.75 for direct benefits and 1.04 including indirect benefits. These estimates are however sensitive to maize prices, incremental maize productivity, and fertiliser costs used in their calculation. The Fiscal Efficiency of the programme and its overall cost are also affected by likely high rates of displacement of unsubsidised by subsidised inputs, and by the subsidy rate and low farmer contributions.

Analysis of national food security scenarios with and without the FISP suggests that in the last 6 years it may have led to average annual savings of maize imports of some 385,000MT, directly offsetting up to between 85 and 110% of programme costs.

Overall, despite its high cost the FISP is making a positive set of contributions to the welfare of Malawians, and this represents a considerable achievement by all those involved in its resourcing, design and implementation in challenging conditions. These contributions are threatened by macroeconomic pressures; by high and increasing population pressure in rural areas; by the high visibility of instances of late implementation, corruption and theft; by evidence of poor targeting; and by political and economic pressures. These contributions and these pressures call for renewed efforts to both work for and demonstrate the benefits and probity of the programme and to improve its efficiency and effectiveness.

Glossary of Acronyms and Terms

ADD	Agricultural Development Division
ADMARC	Agricultural Development and Marketing Corporation
AISAM	Agricultural Input Suppliers Association of Malawi
AISP	Agricultural Input Subsidy Programme
AISS	Agricultural Input Subsidy Survey
AU	African Union
BCR	Benefit Cost Ratio
Bomas	District administrative / commercial centres
Chitowe	23:21:0 fertiliser
CNFA	Citizens Network for Foreign Affairs
CPI	Consumer Price Index
CSI	Coping Strategy Index
DfID	Department for International Development
Dimba	Wetland cultivated in the dry season
EU	European Union
FEWSNET	Famine Early Warning System Network
FAO	Food and Agriculture Organization of the United Nations
FCS	Food Consumption Score
FE	Fiscal Efficiency (the ratio of NPV to fiscal costs)
FGD	Focus Group Discussion
FISP	Farm Input Subsidy Programme
FISS	Farm Input Subsidy Survey
Ganyu	hired casual labour
GDP	Gross Domestic Product
GOM	Government of Malawi
IHS2	Second NSO Integrated Household Survey (2004/5)
IHS3	Third NSO Integrated Household Survey (20010/11)
IMF	International Monetary Fund
LU	Logistics Unit
MASAF	Malawi Social Action Fund
MK	Malawi Kwacha
MOAFS	Ministry of Agriculture and Food Security
MRFC	Malawi Rural Finance Company
MVAC	Malawi Vulnerability Action Committee
NASFAM	National Smallholder Farmers Association of Malawi
NEPAD	New Economic Partnership for African Development
NFRA	National Food Reserve Agency
NGO	Non-Governmental Organization
NPV	Net Present Value
NSO	National Statistical Office
NUE	Nutrient Use Efficiency (kg incremental yield per kg applied)
OPV	Open pollinated varieties (of maize)
PRSP	Poverty Reduction Strategy Paper
RBM	Reserve Bank of Malawi
SFFRFM	Smallholder Farmers' Fertilizer Revolving Fund of Malawi
SGR	Strategic Grain Reserve
TIP	Targeted Inputs Program
VCR	Value Cost Ratio

Appendix 1: Detailed programme cost breakdown

	Million US$							
	2005/6	2006/7	2007/8	2008/9	2009/10	2010/11	2011/12	2012/13
Exchange rate, MK/US$	140.00	140.00	140.00	140.00	141.31	151.55	166.71	364.92
Recorded costs								
Seeds - flexi / legumes	0.00	0.00	1.89	5.24	2.83	6.66	6.26	4.89
Seeds – maize	0.00	5.23	4.58	7.33	17.13	21.64	15.12	11.01
Cotton chemicals	0.00	0.00	0.24	n/a	0.00	0.00	0.00	0.00
Fertiliser b/f from y-1	0.00	0.00	11.82	24.88	35.17	0.00	0.00	0.00
Fertiliser - new supply	51.62	61.16	77.60	237.63	57.18	115.28	112.63	119.52
Fertiliser - private retail	0.00	17.43	24.53	0.00	0.00	0.00	0.00	0.00
Transport Costs	n/a	4.76	5.99	9.24	6.33	5.95	5.54	3.70
Logistics Unit operations	n/a	0.37	0.42	0.24	0.21	0.34	0.38	0.36
ADMARC operations	n/a	n/a	0.00	0.06	1.06	2.24	1.57	1.11
SFFRFM operations	n/a	0.75	1.41	n/a	n/a	2.05	0.98	0.90
District financing	n/a	0.19	n/a	n/a	n/a	n/a	n/a	n/a
Coupon production	n/a	0.11	n/a	n/a	n/a	n/a	n/a	0.09
Communications	n/a	0.20	n/a	n/a	n/a	n/a	n/a	0.01
Input quality monitoring	n/a	0.05	n/a	n/a	n/a	n/a	n/a	n/a
M&E	n/a	0.29	n/a	n/a	n/a	n/a	n/a	0.23
Buyback finance fees	0.00	0.39	n/a	0.00	0.00	0.00	0.00	0.00
Total recorded costs	***51.62***	***90.92***	***128.58***	***284.63***	***119.92***	***154.16***	***142.53***	***142.55***
Less: Farmer redemption due	19.62	17.02	21.32	23.12	11.43	10.59	8.39	4.22
Unused stock (exc. buyback)		0.00	0.00	19.83	0.00	0.00	0.08	0.46
Net recorded Costs	***32.00***	***73.90***	***107.26***	***241.68***	***108.49***	***143.57***	***134.06***	***137.87***
Estimated other costs								
Brought forward stocks	0.00	0.00	n/a	0.62	1.76	0.00	0.00	0.00
MoAFS operations	n/a	n/a	n/a	7.86	7.78	7.26	6.60	6.60
ADMARC/ SFFRFM	n/a	n/a	n/a	1.26	n/a	n/a	n/a	n/a
Voucher printing	n/a	n/a	n/a	0.14	0.14	0.13	0.12	n/a
Other agencies' costs	n/a	n/a	n/a	0.23	0.23	0.21	0.19	0.19
Total est. other costs	*n/a*	*0.00*	*0.00*	*10.11*	*9.91*	*7.60*	*6.91*	*6.79*
Total net costs, recorded & estimated	***n/a***	***73.90***	***107.26***	***251.79***	***118.40***	***151.17***	***140.97***	***144.66***
Total costs, recorded & estimated exc. stock cf	***n/a***	***90.92***	***128.58***	***274.91***	***129.83***	***161.76***	***149.36***	***144.20***
Programme budget	***36.43***	***53.57***	***82.14***	***139.14***	***155.04***	***129.99***	***129.48***	***131.81***
Funding								
Direct Donor Support	0.00	9.51	7.13	37.75	17.48	22.05	44.85	17.56
Balance: Malawi Government	*n/a*	64.39	100.13	214.04	100.92	129.12	95.84	127.11

Appendix 2Farm level budgets for input use with and without subsidy

				From base To actual *Adoption*		Local no fert Local &fert *fert*		Local no fert OPV no fert *OPV seed*		Local no fert Hyb no fert *Hyb seed*		Local &fert OPV &fert *OPV seed*		Local &fert Hyb&fert *Hyb seed* no subs fert		Local no fert OPV &fert *OPV seed &fert*		Local no fert Hyb&fert *Hyb seed &fert*	
Incremental inputs & costs, subsidised prices						kg	MK	kg	MK	kg	MK	kg	MK	kg	MK	kg	MK	kg	MK
Seed	OPV		@MK/kg	0		-	-	8.5	0	-	-	15.4	0	-	-	13.4	0	-	-
	Hybrid		@MK/kg	20		-	-	-	-	13.1	262	-	-	18.3	367	-	-	12.8	257
Fertiliser																			
	N	kg/ha				33.2		-		-		-		-		40.4		39.6	
	P2O5					8.3		-		-		-		-		12.2		11.4	
	NPK 3:21	kg/ha				39.5		-		-		-		-		58.1		54.3	
	Urea	kg/ha				52.3		-		-		-		-		58.8		58.9	
	Cost	MK/kg	10	Cost MK			919		-		-		-		-		1,169		1,132
Transport etc		8	hrs/bag @	75			1,102		-		-		-		-		1,403		1,358
		250	MK/bag				459		-		-		-		-		585		566
Fertiliser application		0.16	hrs/kg @	75	MK/hour		1,102		-		-		-		-		1,403		1,358
Extra harvest labour		0.2	hrs/kg @	100	MK/hour		9,670		1,449		4,663		5,489		10,977		16,118		19,437
Total extra costs							*13,252*		*1,449*		*4,925*		*5,489*		*11,344*		*20,678*		*24,108*
Incremental yield		kg/kg seed		OPV		-	-	8.5	72	-	-	17.8	274	-	-	8.5	114	-	-
		kg/kg seed		Hybrid		-	-	-	0	17.8	233	-	-	30.0	549	-	-	17.8	228
		kg/kg fert				5.3	484	-	0	-	0	-	-	-	-	5.9	692	6.6	744
		Total Incremental yield (kg/ha)					484		72		233		274		549		806		972
Gross benefit @		125	MK/kg				*60,438*		*9,055*		*29,141*		*34,304*		*68,608*		*100,738*		*121,484*
Net benefit MK/ha @		125	MK/kg maize price				47,185		7,606		24,216		28,816		57,265		80,060		97,376
VCR							65.80		n.a.		111.10		n.a.		187.19		86.16		87.48
Net benefit MK/ha @		100	MK/kg maize price				35,098		5,795		18,388		21,955		43,543		59,913		73,079
VCR							52.64		n.a.		88.88		n.a.		149.75		68.93		69.98
Unsubsidised prices																			
Seed	OPV	@MK/kg		331			-		2,816		-		5,106		-		4,438		-
	Hybrid	@MK/kg		550			-		-		7,213		-		10,079		-		7,065
Fertiliser	mixed	Cost MK/kg		283.72			26,062		-		-		-		-		33,172		32,112
Net benefit MK/ha @		125	MK/kg maize price				22,042		4,790		17,265		23,709		47,552		43,620		59,587
VCR							2.32		3.22		4.04		6.72		6.81		2.68		3.10
Net benefit MK/ha @		100	MK/kg maize price				9,955		2,979		11,437		16,849		33,830		23,472		35,290
VCR							1.86		2.57		3.23		5.37		5.45		2.14		2.48

References

Arndt, C., Pauw, K., Thurlow, J., 2013. The Economywide Impacts and Risks of Malawi's Farm Input Subsidy Program.

Buffie, E.F., Atolia, M., 2009. Agricultural Input Subsidies in Malawi: Good, Bad, or Hard to Tell? Food and Agriculture Organisation of the UN, Rome.

Chibwana, C., Fisher, M., Shively, G., 2012. Cropland Allocation Effects of Agricultural Input Subsidies in Malawi. World Development 40, 124-133.

Chirwa, E., Dorward, A.R., 2013a. Agricultural input subsidies in low income coutnries and the Malawi experience Oxford University Press, Oxford.

Chirwa, E., Zakeyo, C., 2006. Malawi, in: Thomas, H. (Ed.), Trade Reforms and Food Security: Country Case Studies and Synthesis. Food and Agriculture Organisation, Rome.

Chirwa, E.W., Dorward, A., Matita, M.M., 2011a. Conceptualising Graduation from Agricultural Input Subsidies in Malawi, FAC Working Paper 029. Future Agricultures Consortium, Brighton, Sussex.

Chirwa, E.W., Dorward, A.R., 2013b. Private Sector Participation in the Farm Input Subsidy Programme in Malawi, 2006/07 - 2011/12, FAC Working Paper 64, . Future Agricultures Consortium, , Brighton, Sussex.

Chirwa, E.W., Matita, M.M., Mvula, P.M., Dorward, A.R., 2011b. Impacts of the Farm Input Subsidy Programme in Malawi. , Paper prepared for Malawi Government / DFID Evaluation of Malawi Farm Input Subsidy Programme. School of Oriental and African Studies, University of London

Dorward, A., 2013. Agricultural labour productivity, food prices and sustainable development impacts and indicators. Food Policy 39, 40-50.

Dorward, A., Chirwa, E., 2013. Preliminary analysis of coupon receipt and use reported in the IHS3.

Dorward, A.R., Chirwa, E.W., 2010a. Evaluation of the 2008/9 Agricultural Input Subsidy Programme, Malawi: Maize Production and Market Impacts. SOAS, University of London, London.

Dorward, A.R., Chirwa, E.W., 2010b. A review of methods for estimating yield and production impacts. , Paper prepared for Malawi Government / DFID Evaluation of Malawi Farm Input Subsidy Programme. SOAS, University of London.

Dorward, A.R., Chirwa, E.W., 2011. Improving benefit cost analysis for Malawi's farm input subsidy programme, 2006/7 to 2010/11 Paper prepared for Malawi Government / DFID Evaluation of Malawi Farm Input Subsidy Programme. SOAS, University of London.

Dorward, A.R., Chirwa, E.W., 2012a. Evaluation of the 2011/12 Farm Input Subsidy Programme, Malawi: report on programme implementation and benefit cost analysis. SOAS, University of London, London.

Dorward, A.R., Chirwa, E.W., 2012b. Informal Rural Economy Modelling of Programme Impacts, 2005/6 to 2010/11: Discussion Paper, Evaluation of the 2010/11 Farm Input Subsidy Programme, Malawi. SOAS, University of London, London.

Dorward, A.R., Chirwa, E.W., 2012c. Targeting, Discussion Paper prepared for Malawi Government / DFID Evaluation of the 2011/12 Malawi Farm Input Subsidy Programme SOAS, University of London, London.

Ellis, F., Manda, E., 2012. Seasonal Food Crises and Policy Responses: A Narrative Account of Three Food Security Crises in Malawi. World Development 40, 1407–1417.

FUM (Farmers Union of Malawi), 2013. Promoting the Participation of farmers in monitoring farm input subsidy programme in Malawi 2012/2013 cropping season, Report prepared for DFID. , Lilongwe. .

Gabre-Madhin, E., Kherrallah, M., Minot, N., 2001. Impact of Agricultural Market Reforms on Smallholder Farmers in Benin and Malawi. IFPRI, Washington D.C.

Government of Malawi, 2012. 2012/13 Budget Statement, Ministry of Finance, Lilongwe. Ministry of Finance, Lilongwe.

Government of Malawi, 2013. 2013/14 Budget Statement, Ministry of Finance, Lilongwe. Ministry of Finance, Lilongwe.

Holden, S., Lunduka, H., 2012. Who Benefit from Malawi's Targeted Farm Input Subsidy Program? Forum for Development Studies DOI:10.1080/08039410.2012.688858, 1 - 25.

Holden, S., Lunduka, H., 2013. Input subsidies,cash constraints, and timing of input supply. American Journal of Agricultural Economics.

Holden, S., Lunduka, R., 2010a. Impacts of the fertilizer subsidy programme in Malawi: targeting, household perceptions and preferences., Noragric Report, As, pp. iii-pp.

Holden, S., Lunduka, R., 2010b. The political economy of input subsidies in Malawi: Targeting efficiency and household perceptions, Draft for comment. School of Economics and Business, Norwegian University of Life Sciences, Ås, Norway, pp. no-no.

Kamanga, B.C.G., Waddington, S.R., Whitbread, A., Almekinders, C.J.M., Giller, K.E., 2013. Improving the efficiency of use of small amounts of nitrogen and phosphorus fertiliser on smallholder maize in central Malawi. Experimental Agriculture.

Karamba, R.W., 2013. Input subsidies and their effect on cropland allocation, agricultural productivity, and child nutrition: evidence from Malawi, Faculty of College of Arts and Sciences. American University.

Kherallah, M., Govindan, K., 1999. The sequencing of agricultural market reforms in Malawi. J. Afr. Econ. 8, 125-151.

Logistics Unit, 2013. Final Report: Implementation of Agricultural Inputs Subsidy Programme 2012/13. Logistics Unit, Lilongwe.

Makumba, W.I., Matumba, L., Liwimbi, L., Chisama, B., 2012. Improved Nutrient Management for Maize Production in Malawi in Smallholder Farms (mimeo). Department of Agricultural Research, Ministry of Agriculture and Food Security, Chitedze, Malawi.

Manda, E., 2010. Price instability in maize markets in Malawi. University of East Anglia.

Mapila, M.A.T.J., Kirsten, J.F., Meyer, F., Kankwamba, H., 2013. A Partial Equilibrium Model of the Malawi Maize Commodity Market, IFPRI Discussion Paper 01254. IFPRI, Washington DC.

Mason, N.M., Ricker-Gilbert, J., 2012. Disrupting Demand for Commercial Seed: Input Subsidies in Malawi and Zambia, Working Paper No. 63. Indaba Agricultural Policy Research Institute (IAPRI), Lusaka.

Maxwell, D., Caldwell, R., 2008. The Coping Strategies Index: Field Methods Manual. CARE.

Meyers, R., 2008. Evaluating the efficiency of inter-regional trade and storage in Malawi maize markets, Report for the World Bank. Michigan State University, East Lansing, Mi, USA.

Nakhumwa, T.O., 2006. Rapid evaluation of the 2005 fertiliser subsidy programme in Malawi. , CISANET Policy Paper No 10. CISANET, Lilongwe.

National Statistics Office, 2008. 2008 Population and housing census main report. National Statistical Office, Zomba, Malawi.

National Statistics Office, 2009. Population Projections Malawi, 2008 Census.

Reserve Bank of Malawi, 2012. Financial and Economic Review, April - June 2012. Reserve Bank of Malawi, Lilongwe.

Ricker-Gilbert, J., 2011. Household-level impacts of fertilizer subsidies in Malawi, Agricultural, Food and Resource Economics. Michigan State University.

Ricker-Gilbert, J., Jayne, T., 2010. The impact of fertilizer subsidies on displacement and total fertilizer use, Powerpoint Presentation, Lilongwe.

Ricker-Gilbert, J., Jayne, T.S., Chirwa, E., 2010. Subsidies and Crowding Out: a Double Hurdle Model of Fertilizer Demand in Malawi. American Journal of Agricultural Economics 93, 26-42.

School of Oriental and African Studies, Wadonda Consult, Overseas Development Institute, Michigan State University, 2008. Evaluation of the 2006/7 Agricultural Input Supply Programme, Malawi: Final Report. School of Oriental and African Studies; March 2008, London.

Snapp, S.S., Blackie, M.J., Gilbert, R.A., Bezner-Kerr, R., Kanyama-Phiri, G.Y., 2010. Biodiversity can support a greener revolution in Africa. Proceedings of the National Academy of Sciences.

Taylor, J.E., 2012. A Methodology for Local Economy-wide Impact Evaluation (LEWIE) of Cash Transfers United Nations Food and Agricultural Organization and UNICEF-ESARO, May 2012.

Taylor, J.E., Filipski, M., 2014. Beyond Experiments: Evaluating Development Impacts with Local Economywide Models. . Oxford University Press (in press). Oxford.

Thome, K., Filipski, M., Kagin, J., Taylor, J.E., Davis, B., 2013. Agricultural Spillover Effects of Cash Transfers: What Does LEWIE Have to Say? American Journal of Agricultural Economics 95.

Tschirley, D.L., Jayne, T.S., 2010. Exploring the Logic Behind Southern Africa's Food Crises. World Development 38, 76-87.

Verma, V., Marchant, T., Scott, C., 1988. Evaluation of crop-cut methods and farmer reports for estimating crop production, Results of a methodological study in five African countries. Longacre Agricultural Development Centre Ltd.

Whitbread, A., Sennhenn, A., Grotelüschen, K., 2013. Nitrogen-use-efficiency in maize-based farming systems in Malawi: a simulation study and meta-analysis of literature: final report. Crop Production Systems in the Tropics, Faculty of Agricultural Sciences, University of Goettingen,, Göttingen, Germany.

World Food Progamme, 2008. Food Consumption Analysis: Calculating and Use of the Food Consumption Score in Food Security Analysis. World Food Progamme, WFP Vulnerability and Mapping Branch, Rome.

Zeller, M., Diagne, A., Mataya, C., 1998. Market access by smallholder farmers in Malawi: implications for technology adoption, agricultural productivity and crop income. Agric. Econ. 19, 219-229.